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ABSTRACT

This document contains reports examining research designs for Educational Resources Information Center (ERIC) usage studies at three levels: (1) system operations; (2) subscribers to the services provided; and (3) the ultimate "end-users" of the service. The first level report, which addresses ERIC as an information network, proposes two changes which would provide greater coordination and cohesion for the system--the development of a more hierarchical network articulation of the ERIC system, and a systematic reporting system a part of a more formal management information system. This report describes a framework for comprehending, examining, and managing the ERIC system; describes useful data categories and appropriate levels of data collection; suggests a method of developing a model data collecting system; and examines these suggestions with present possibilities. The second level report recommends non-experimental approaches to ERIC use assessments and examines methodological and research design considerations for ERIC usage studies. The third level report focuses on ERIC impact studies, i.e., how ERIC products and services have affected the end-user. General methodological recommendations are made for particular studies, and all available ERIC impact studies are analyzed in terms of these recommendations, and in terms of the specific impact measures employed. Research plans for future impact studies are included. (CWM)

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ERIC/IR
Special Project Report

DESIGN OF ERIC USAGE STUDIES

Volume II

ERIC Clearinghouse on Information Resources
Syracuse University
1978

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Volume II

Appendices:

Consultants' Reports

I. Level I ERIC Usage Study: Data Gathering for the Management of ERIC as an Information Network
-- by Evelyn Daniel

II. Level II ERIC Usage Study: Recommendations on Non-Experimental Approaches to ERIC Use Assessments
-- by B. K. L. Genova

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ERIC/IR
Special Project Report

DESIGN OF ERIC USAGE STUDIES

Volume II

INTRODUCTION

This Volume contains the reports in full of three consultants who tackled the job of recommending Level I, II, and III type ERIC usage study designs. (See Figure 1.) Volume I of this ERIC/IR Special Project Report contains an executive summary for each report, as well as introductory tables and typologies prepared by the project staff.

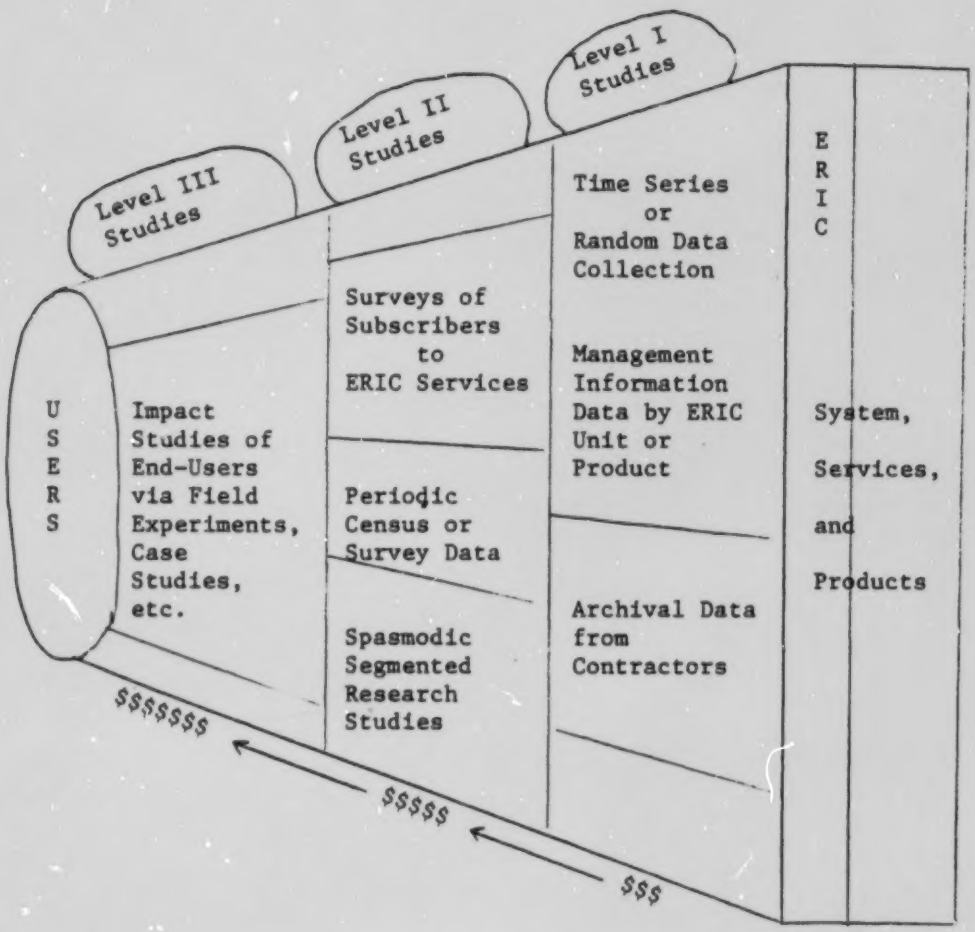


Figure 1. Types of Usage Studies with Varying Data Collection Methods and Analysis, Variation in Implementation Costs, Validty, Reliability

APPENDIX I

Level I ERIC Usage Study

Data Gathering for the Management of ERIC as an Information Network

by Evelyn Daniel

Introduction

The story of the six blind men with the elephant has been greatly overused. Perhaps one reason lies in the fact that it continues to provide a dramatic and vivid analogy for a frequently recurring phenomenon. As the complexity and size of our organizations increase, we have become accustomed to people holding a wide spectrum of perceptions about the nature of the particular agency with which they are dealing. This is not any the less true when dealing with ERIC, a system (of sorts) of wide variety and many contact points -- a system intended for greatly divergent user groups with a wide range of purposes for their use -- a system of diffuse and global goals on the national level and great diversity of specific objectives among the various component parts.

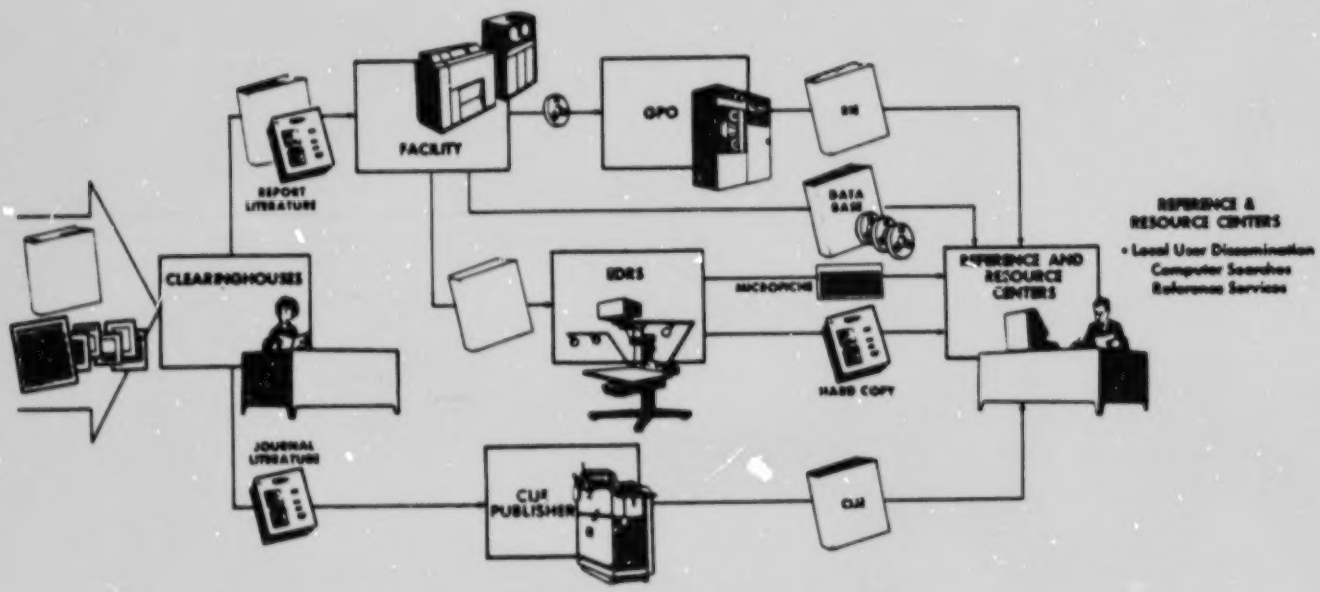
Obviously then, with such a degree of differentiation in the ERIC system, there must be a strong impetus to search for integrative devices -- ways to encompass and comprehend this vast and sprawling young giant without inhibiting the flexibility and experimentation necessary for continued growth. The dynamic tension between the need for greater integration and the opposing need for continued differentiation provides the backdrop for this paper. At the moment the decentralized character of the system seems the dominant factor. Efforts to understand and control, much less direct, the growth of the system suffer from an overbalancing toward the differentiation end of the scale.

PART I. Suggested Views of ERIC as a Network of Services

In this paper, the writer will proffer two complementary suggestions that may provide greater coordination and cohesion for the ERIC system. The first suggestion is for a more hierarchical network articulation of the ERIC system; the second suggestion is for a systematic reporting system as part of a more formal management information system.

Neither suggestion is totally new. Various approaches to describe the ERIC system to the user exist. One recent example is the undated publication of Central ERIC entitled, How to Use ERIC, in which the ERIC system is described as a "system with four levels". (p. 5) This diagram is provided below.

ERIC is a system with four levels.



The descriptive text reads as follows:

> The first or Governmental level is represented by Central ERIC (the funder, policy setter, and monitor) . . . The second or non-profit level is made up of the 16 Clearinghouses located at universities or professional societies. The third or commercial level consists of the centralized facilities for managing the data base, putting out published products, making microfiche, and reproducing documents. Fourth are the users who receive the benefit of these activities.

The four levels presented are not really hierarchical as the word "levels" might suggest. The diagram seems purposefully to have been presented horizontally rather than vertically to prevent such a misconception. Further, I venture to suggest, this description fails to provide a useful framework for comprehending the ERIC system either from the viewpoint of the user, the standing order customer, the clearinghouse staff, and perhaps even from Central ERIC itself. The viewpoint seems library-like with heavy emphasis on materials, their acquisition and processing, rather than services for the user.

A somewhat different system articulation of the ERIC network will be presented in this paper as a more helpful framework for comprehending the system from a variety of perspectives -- that of the funder, the manager, the staff, and the user.

The second suggestion derives from the first. Given a satisfactory description of the system, systematic techniques for data gathering about use in a management information system framework can be devised. The many use studies by and for ERIC have provided gross figures on use, uses, and users, but they lack comparability and they lack inherent directions for management. A good management information system will provide data for decision making at all levels of the ERIC system. A tentative description and method of developing an appropriate management information system will be presented.

This paper, then, is divided into three parts for ease of examination. Part A, entitled ERIC Network Articulation, describes a framework for comprehending, examining, and managing the ERIC system. Part B, entitled Management Information System, describes useful data categories, appropriate levels of data collection, and suggests a method of developing a model data collecting system. Part C, entitled Recommendations, examines these suggestions in light of the art of the possible.

A. ERIC Network Articulation

First, it may be helpful to discuss some prior decisions that were necessary before developing an alternative framework. The first concern was whether ERIC should be conceived as a purveyor of products or whether ERIC's primary mission was to provide services. A second concern focused on the standing order customer. Were there advantages to seeing them as members of the ERIC system rather than customers only who stood outside the boundaries of the ERIC system? A third problem centered on the clearinghouses with their dual function. What should be the primary allegiance of the clearinghouse -- to the national interest community or to the local geographic community? Given that both are important, what reorientations should take place and/or what conflicts might be foreseen and prevented? The fourth problem concerned the hierarchy. If there was value to conceiving a single hierarchy for the ERIC system, what were the appropriate levels and what were the unique responsibilities of each of these levels? Finally, how were the system elements related in the network? What degree of independence/dependence should each element have?

1. System of Products VS. System of Services. Current management theory has become increasingly results-oriented rather than activity-oriented. (For a good overview of current arguments on this topic, see Waldhart, Thomas J.,

"Implementing Results-Oriented Management in Academic Libraries", The Journal of Academic Librarianship, 4(September 1978), 209-213.) In the more traditional activity-oriented view of management, management was seen as a system of authority, emphasizing such activities as organizing, directing, controlling, and staffing. In a results-oriented approach, management is conceived as a resource to the organization and results are stressed through participation and coordination. The stress on results focuses more attention on outcomes and less on internal activities. Activity-oriented management might express objectives in terms of products even though the products are only instrumental in achieving the actual overall goal of the organization.

If ERIC is seen as a system of products, then a relatively simple marketing model, looking at sales, costs, and returns, geographic distribution, number of continuing customers, etc., would be sufficient. It is apparent from the emphasis placed on the end use that this product orientation is not acceptable. Rather, a view of ERIC as a system of services seems the appropriate model and has the added advantage of alignment with current results-oriented management theory.

2. The Standing Order Customer. Many of the user studies focus on the standing order customers. (A particularly useful one is that prepared by Eleanor V. Horne, A Profile of ERIC Microfiche Collection Sites, ERIC Clearinghouse on Tests, Measurement, and Evaluation, Princeton, NJ, 1976.) These SOCs can be seen in two different ways. If ERIC is conceived of as a system of products, the SOCs are the retailers and the end point. However, looking at ERIC as a system of services, the SOCs become the primary outlet point, the place where the end user interfaces with the ERIC system. This means that the SOCs might helpfully be considered as elements of the ERIC system and not external to it.

In terms of policy and allocation of resources, it would mean greater attention to the SOCs, development of incentive plans to encourage the SOCs to play a more responsive role, and a stronger hierarchical network concept. Presently the Clearinghouses vary in the amount of contact and concern with the SOCs and the SOCs do not understand or recognize the Clearinghouse role. Greater attention to the SOCs has great implication for the Clearinghouses to which we now turn.

3. The Dual Function of the Clearinghouses. In this conception of a more integrated, controllable system, the Clearinghouses assume central importance. It is they who will be the middle managers, coordinating policy, plans, and resource allocation for Central ERIC to those SOCs in their geographic purview, and at the same time, systematically collecting feedback from the SOCs to pass on to Central ERIC.

The Clearinghouses presently vary widely in their emphases, and no doubt rightly so. Most, however, focus strongly on their national interest community and spare little time and attention for the SOCs in their geographic region. There are many inherent conflicts, of course, in asking the Clearinghouses to assume the dual function of supervisor/facilitator to the SOCs in addition to their prescribed duties of product acquisition and development and marketing/consulting contacts with associations and specialists in their subject field.

In the system coordination aspect of the Clearinghouse, there would be a number of additional general education and consultation functions required by the Clearinghouses as they "big-brother" the SOCs, but probably the primary additional role would be as collector of reliable use data in a systematic fashion. To some extent, the Clearinghouses presently perform the former general education function. They might spend more time in referring end users to

appropriate SOC facilities, reserving direct user interface for occasions where subject specialist knowledge is important and necessary.

The establishment of the Clearinghouse as the primary collecting point for use data would have a number of advantages. Presently, Central ERIC commissions national user studies to document the value and the impact of the ERIC system. The data collected, however, are often gross estimates and so, are unreliable. Perhaps even some inaccuracies occur in the present use data collected by the Clearinghouses, at least to the extent that the data does not seem inherently useful to them and is only being collected for reporting purposes. The accuracy of the data would undoubtedly be enhanced if it were meaningful and useful to the level where it is being collected.

A Hierarchical Systems Framework

Figure 1 on the following page presents a view of the ERIC system which may be a useful and timely way to conceptualize it. Each of the three levels shown has its own distinct responsibility and requires certain kinds of information in order to fulfill its responsibility competently. The information needed by each level will be, in most cases, summaries of the information needed at the more articulated level. There may be value in examining this system from the bottom up, giving primacy to the grass roots level where most actual use occurs.

SOCs, as shown in Figure 1, are categorized into one of three types. Types 1 and 2 are quite different in their institutional constraints and in their intended user groups. Type 1 SOCs are the college and university subscribers. They are different in that they are constrained by the university environment to serve those users who are members of the university. A second important aspect is that they see ERIC as only one of a number of educational

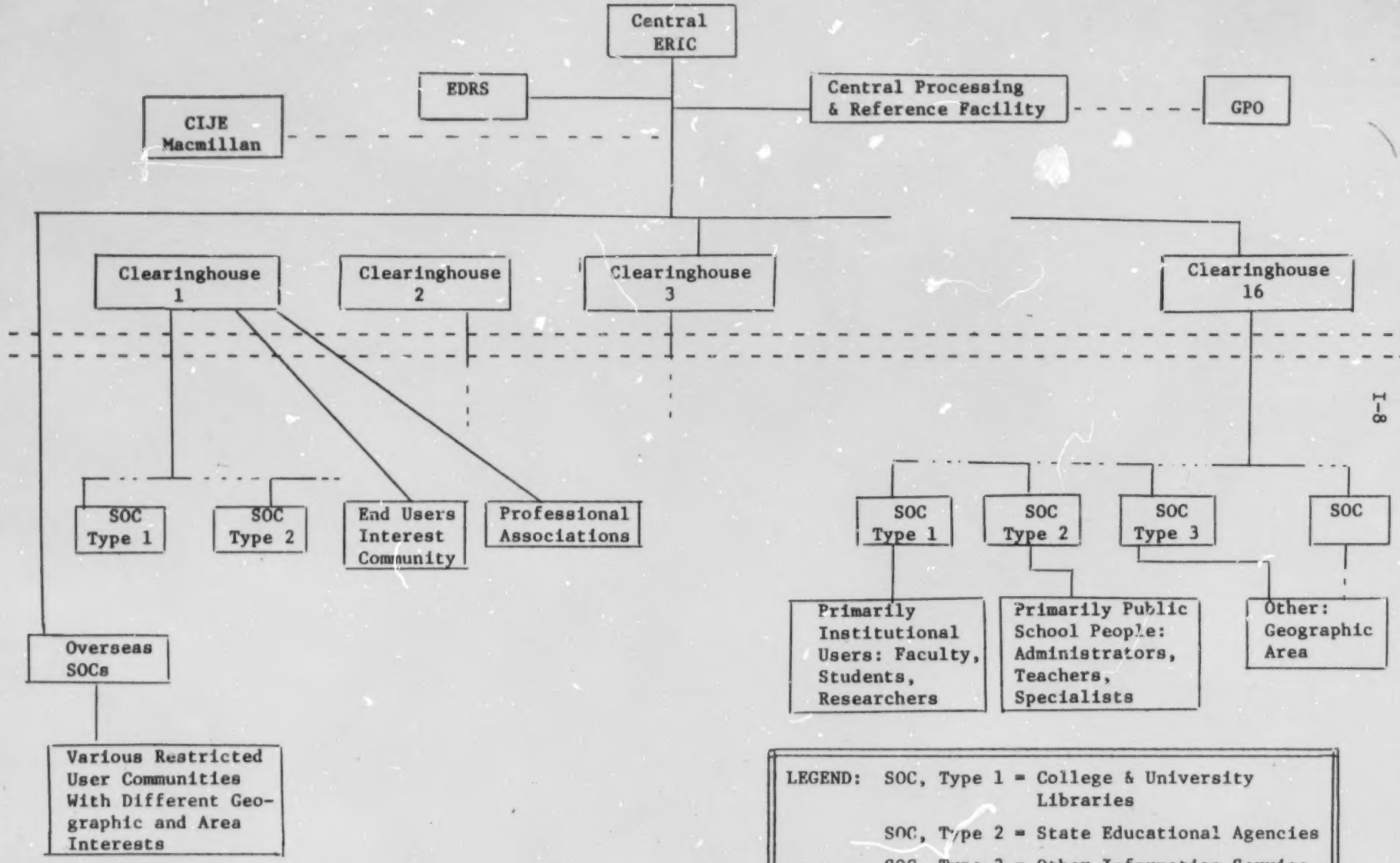

Central ERIC
EDRS
Central Processing & Reference Facility
GPO
CIJE Macmillan
Clearinghouse 1
Clearinghouse 2
Clearinghouse 3
Clearinghouse 16
SOC Type 1
SOC Type 2
End Users Interest Community
Professional Associations
SOC Type 1
SOC Type 2
SOC Type 3
SOC
Primarily Institutional Users: Faculty, Students, Researchers
Primarily Public School People: Administrators, Teachers, Specialists
Other: Geographic Area
Overseas SOCs
Various Restricted User Communities With Different Geographic and Area Interests
LEGEND: SOC, Type 1 = College & University Libraries
SOC, Type 2 = State Educational Agencies
SOC, Type 3 = Other Information Service Centers
The double horizontal line through this figure marks the formal and informal levels of control by ERIC.

Figure 1. Articulted ERIC Network

resources available to them. Use data, to be helpful for this group, must reflect both the constraints and the larger set of available resources.

Type 2 SOCs are those that serve public school personnel. These are often sponsored by state education agencies. Some are statewide computerized networks such as EPSIS in New York State, SMERC in California, IRDN in Illinois. Others are based in a region, a county, or even a large city school system. As in Type 1 SOCs, use is constrained by jurisdictional boundaries -- only certain classes of users (administrators, specialists, and teachers) are recognized and only certain kinds of users (directly work-related) are permitted. Use data for Type 2 SOCs may be more congruent with the ERIC system as a whole and may be obtained more easily than that for Type 1.

Type 3 SOCs are those other types that are not so distinct and so easily grouped. These might include public libraries in large cities, special agencies like the Southwest Education Development Laboratory in Texas, or Research for Better Schools in Pennsylvania, and associations like the Ohio Education Association. There are fewer of these types. Their use data requirements may be quite specialized, but perhaps in most cases more like those of Type 1 than those of Type 2.

Overseas SOCs are another type altogether and probably should be considered apart from the articulated system developed here, although perhaps another Clearinghouse should be set up to focus on international needs and interests, in which case the pattern would still be appropriate, although the geographic community would be far-flung indeed.

At levels above the SOCs, trend data on the number of SOCs of each type would be useful for prediction purposes. Also, as the SOCs are not evenly scattered either by area or by population across the United States, expectations on use relative to potential use would vary widely. Each SOC needs census data

on population to be served, percent of population that are current users, percent that are repeat users, percent that are first time users, etc. SOCs also need information to help them predict when heavy use times will occur. This can be predicted in part from data on types of use relative to month of year. Central ERIC may be less interested in the time-bound aspect of this data, but more interested in numbers and proportions of types of use aggregated. SOC data on user satisfaction with products and services is another category that can serve two purposes -- helpful for the SOCs and necessary for the decision-making levels of ERIC.

The above are only a few examples of the congruencies between information needs that SOCs have and those of higher levels of ERIC.

The dual function of the Clearinghouses has already been described. Both missions are primary. The first mission, providing service to a national interest group clientele, requires the following activities:

Professional Linkages
- Identification
- Formal/Informal Associations
- Workshops
- Orientations

Publication Program
- Information Analysis Products
- Special Articles
- Regular Columns
- Newsletters
- Indexing and Abstracting Program

Direct Provision of Information (Content)
- Simple/Complex Reference Questions
- Computerized and Manual Searches
- Provision of Collection/Space/Staff
- Referrals

Instruction/Education Program
- Workshops
- Formal/Informal Instruction

to perform the second mission, acting as a regional node in a national network for distributing ERIC products and services, some of the same types of activities are necessary -- the linkages, a publication program, direct provision of information, instruction, but here they are directed to a specific geographical regional unit and consist of more general information about the total ERIC system and services. Linkages are primarily to the SOCs and secondarily directly to end users. The publication program here would be more locally oriented and general in nature, although announcements of more content-oriented activities would be included. A fifth activity called consultation might be added or might be included as part of the Instruction/Education Program. This might involve managerial suggestions to SOCs and ongoing evaluative procedures.

At Central ERIC the relationships to the SOCs should probably be less direct. Directives and general information could be funneled through the Clearinghouses. Feedback information from the SOCs to Central ERIC could also funnel through the Clearinghouses. This has the added benefit of keeping the middle level of the system up to date.

This conception of the ERIC system is not greatly different. The change is in the direction of greater integration and coordination. The usefulness of the framework may become more apparent as the proposed management information system is presented.

B. Management Information System

All organizations have multiple information needs -- some recurring and anticipated, some unanticipated and intermittent. Management must systematize as much as possible information collection for recurring and anticipated needs so that energy and time are available for the more unusual and ill-structured needs (but perhaps the most important ones). A good management information system provides a system for collecting and aggregating information from various

sources for pre-determined information needs.

Many definitions of a management information system are available. Most seen to include these four important elements:

(1) The MIS is used as a basis for decision-making.

(2) It is a structured and systematic approach to information collection.

(3) Information collection must be coordinated with the agency or individual who generates it.

(4) Information must be collected from both internal and external sources.

Not all user information needs can be captured by a management information system. In fact, the first attempts to create the MIS will be crude and should probably err on the exclusive side. Concurrently with the MIS will be the need for research projects focused on specific problems. In-depth case studies, user trails, product use analyses are some examples of this latter type. The focus on the predictable, recurrent user information needs rather than these intermittent and unusual information needs in this paper is in no way intended to imply lesser importance to the latter type. In fact, given that a good reliable continuing source of user information can be systematically provided, the opportunity for more powerful information analyses will be enhanced.

In this section of the paper, the information needs of the ERIC system will be examined. Some principles to be followed in developing a management information system will be presented and a tentative model of a data collecting system will be advanced.

1. Information Needs of ERIC. There seem to be two major purposes for user information that exist at all levels of ERIC. The first is for internal management and planning. The second is for information exchange. For the former, user information is needed to improve management and decision-making, especially with

respect to the allocation and utilization of resources, and it is also needed to demonstrate organizational effectiveness and efficiency in the use of resources. In addition, as there are no absolute measures of performance for the SOCs, the Clearinghouses, or Central ERIC to assess performance against, information exchange can provide comparative data. The basis of comparison will differ, but some common set of elements with agreed-on terminology and definitions will make baseline comparisons possible inter-institutionally and longitudinally.

Although these needs for information exist at all levels of ERIC, the degree of detail necessary varies with the level and with the size and sophistication of the facility. Methods of aggregation and disaggregation, without destroying the integrity and validity of the reported data, will require careful consideration.

2. Principles for Developing a Management Information System. Five general principles will be stated with a few brief comments on each. First, a successful management information system depends on local participation. This principle crops up so often, in so many different ways, it is almost a truism, yet frequent statement doesn't obviate the need for repetition yet one more time. It is Central ERIC's responsibility to provide a framework and to establish overall goals for the system; but within that framework, a management-by-objectives technique needs to be developed involving interaction between the SOCs and the Clearinghouses in establishing information needs and uses, developing data categories with definitions, and setting up periodic review and analysis sessions. As the grass roots agencies take ownership of the data collection system and build it to respond to their own needs, the data collection will become important to them, will enhance their managerial performance, and will become more accurate.

Second, data collected should be descriptive only. Categories should be set

up to record actual use, uses, and users. Inferential techniques can be performed on the data at intervals by qualified experts. The data collection system should be kept as simple as possible.

Third, data should be collected on a sampling basis. It is usually the case that greater inaccuracies result where the attempt is made to count every individual instance. Counting is time-consuming and tedious. Once a data category is established, techniques exist to determine the appropriate sample size and interval. In addition, sampling techniques can be used to measure activities otherwise not considered a subject to measure.

Fourth, the data collection system should be differentiated. Not all data needs to be collected at each site. In some cases, different but parallel subcategories may be necessary to give the end user site appropriate data. An example of this might be the classification of users. Some SOCs will be considerably more concerned with whether a teacher comes from an elementary or secondary school. In others the concern will be on whether that teacher is a social studies teacher or an English teacher. In still others both categories of information will be necessary. In addition, not all items need to be collected each year or from each site in order to maintain the integrity of the total system. Clearinghouses may choose to sample SOC user information systematically on a rolling year basis rather than each year. The need to know should dictate data gathering and consumption at each level of ERIC.

Finally, the Management Information System should be phased in over a three to five year period. The present information collecting system should be used as the point of departure. Useful categories can be gradually elaborated and re-grouped as the articulated system voices its opinions. In the case of the SOCs with their ambiguous membership in the ERIC system, incentives, in addition to the incentive of better management data, may have to be developed, even though

the latter incentive is a powerful one.

3. Tentative Model of a Data Collection System. Applying the present data categories used by the Clearinghouses to a simple matrix, Figure 2 demonstrates how these programmatic functions can be mapped into a series of program measures. Financial data is presently offset against the programmatic functions of the Clearinghouse. Personnel measures could easily be added, either in service months or manhours, perhaps divided into professional, paraprofessional, and clerical categories. The facility measure would include items like assignable square feet and room use categories. Equipment types and availability might also be included here. The activity measures, using present descriptor items, includes the counts of number of items processed, number of workshops conducted, number of articles published, and the like. Analytic measures or performance measures are those measures that assess the level of objective attainment. These might include, but not be limited to, criteria such as the following measures:

Policy Effectiveness
Ex.: Availability of long range plan
Number of times long range plan has been reviewed

Operations Effectiveness
Ex.: User satisfaction with accuracy and timeliness of question answering

Organizational Productivity
Ex.: Amount of activity performed per dollar expended or per service month of personnel

Accuracy
Ex.: Error rate or percent of items done correctly

Timeliness
Ex.: Lag time between initiation of activity and completion

Staff Morals
Ex.: Employee satisfaction
Average number of sick days taken
Employee turnover rate

Program Measures / Programmatic Functions	FINANCIAL	PERSONNEL	FACILITIES	ACTIVITIES	ANALYTIC MEASURES
DATA BASE BUILDING					
USER SERVICES					
INFORMATION ANALYSIS PRODUCTS					
ADMINISTRATION					
TOTAL					

Figure 2. Management Information System Matrix for ERIC

This information simply fleshes out the present reporting system, providing a fuller picture of activity and resource use. It should prove helpful in increasing control and in developing useful longitudinal studies of Clearinghouse activity.

Still, this data is internal only, concerned with efficiency and not effectiveness, and without real connection to the end user. A similar matrix can be developed to examine user services. Figure 3 shows a matrix that juxtaposes type of service against various user characteristics.

In order to be able to make meaningful comparisons, environmental data and target group data should also be collected. Environmental data might include the following:

Type of Facility - whether with a university library or a state education agency, an association, a public library, etc.

Legal Control -- whether state, federal, county, school district, municipality, regional or private

Primary Service Area -- population and area

Access -- days and/or hours open to user population

Target group data might include characteristics of potential user population and source of that information.

A third matrix should probably be developed for Clearinghouses to collect information on professional linkages (workshops, presentations, exhibits) set against audience type and objectives of contact. Association data (number of associations, plus number of activities for each one) could be used for base line comparison.

This section is labelled a tentative model and so it must be until representatives from the various elements can determine what information is needed and collectible at each level.

User Characteristics / User Services	TYPE OF CONTACT	PURPOSE OF CONTACT	USER TYPE	PURPOSE OF END USE	PERFORMANCE MEASURES
PRODUCTS					
USER WORKSHOPS					
RESEARCH ADVISORY SERVICE					
MACHINE-ASSISTED REFERENCE					
MANUAL REFERENCE					
CLIENT REFERRAL					
ENVIRONMENTAL DATA:					
INSTITUTIONAL CHARACTERISTICS					
TARGET GROUP DATA:					
PRIMARY POPULATION					
SECONDARY POPULATION					

Figure 3. User Services/User Characteristics Matrix for ERIC

C. Recommendations

If the suggestions in this paper seem to be worthwhile goals, what would be a reasonable plan of implementation? For an organization as large and as diverse as ERIC a totally new system would be exceedingly difficult to implement. The suggestions here proposed advocate using the available data collection system and gradually increasing its power and complexity and its extensibility so that within a three to five year period a true management information system, including primary usage data, could be implemented.

The changes suggested here include a new role for the SOCs, an elaborated role for the Clearinghouses, and a leadership role for Central ERIC. Some recommendations as to useful steps to be taken towards implementation are as follows:

(1) Mount a major educational campaign directed to the SOCs, focusing on their part in the total ERIC system.

(2) Mount a second campaign directed to the Clearinghouses to reemphasize their responsibility for the SOCs in their geographic district.

(3) As part of this campaign, set up a series of workshops or other meetings asking the SOCs to discuss their user information problems to see where (or if) a data collection system of mutual benefit to the SOCs and to ERIC could be developed.

(4) Ask the Clearinghouses to conduct these SOC workshops or meetings with perhaps a representative from Central ERIC so that they would be aware of SOC user needs.

(5) Ask the Clearinghouses also to meet to discuss their information problems with representatives from Central ERIC.

(6) Develop a useful typology of SOCs so that comparable data cate-

gories can be established.

(7) Using the outcomes of SOC and Clearinghouse information problem meetings, set up series of meetings for representatives of SOCs, Clearinghouses, and Central ERIC to develop management information system.

(8) Establish standard terminology and definitions for acceptable data categories. Consider categories developed by American National Standards Institute.

(9) Develop standard format for uniform record keeping with optional categories that can be deleted and opportunities to add categories for other local required information.

(10) Use expert to help establish appropriate sample sizes and frequencies for recurring usage data.

(11) Assist Clearinghouses in developing a rolling data collection plan for all SOCs in their geographic region so that all SOCs are sampled at least once every five years.

(12) Select a set of SOCs that are already keeping good records and that include a range of types, sizes, and geographical areas and set up a ten-year longitudinal study. Some incentives may have to be provided to the parent institutions.

(13) At periodic intervals, engage an expert to analyze the descriptive data collected in more sophisticated ways.

(14) Provide periodic data summaries to Clearinghouses so that they can compare their results with the aggregate or with selected others like them on certain characteristics.

(15) Resist temptation to collect more data in greater detail at any particular level than is necessary for management decision-making.

(16) Prefer accuracy to quantity and a little information freely provided to much information grudgingly given. Less is more.

APPENDIX II

Level II ERIC Usage Study

Recommendations on Non-Experimental Approaches
to ERIC Use Assessments

by B. K. L. Genova

I. Methodological Consideration and Review of Previous Studies

This paper is conceived as a component of a larger project and addresses issues pertinent to ERIC use assessments. The overall project goal, as I understand it, is to lay a foundation for a systematic look at ERIC: its use and impact. Such bipartite definition of the project's goal is important in my opinion, and must be established at the onset of this discussion. Use aspects emphasize the descriptive, cumulative assessment of the extent to which ERIC products and services have penetrated the workday reality of people; is is the "bookkeeping" on how many have recognized ERIC as a source of information and use it -- alone, or alongside other sources. The basic questions behind the use focus are: "How many have noticed ERIC?", "Who are they?" Impact assessments, on the other hand, address such issues as "What difference did ERIC make?" It is often a post-utilization concern with effects of various kinds, long or short-term.

Depending on the pursuit of either of these separate foci, different methodologies seem to offer the best approach. Both the planning/management needs of ERIC and the norms imposed on sound research would seem to converge here. That is, if studies are to be undertaken, then the obtained data should be reliable and valid, the results should be generalizable. Otherwise, intelligent guesswork could suffice.

Impact assessments are best served by the field experimental approach with its control which ensures trustworthiness of data and comparisons. The effect of narrow aspects of ERIC, as it stands now, or the effects of changes,

new promotion drives, new policy or procedures, are best captured this way. The survey approach, on the other hand, is better suited for use assessments, given the emphasis on representativeness and generalizability. Thus, broader aspects of ERIC, use patterns and longer term changes and developments can be studied well. Therefore, this paper will deal with non-experimental approaches to ERIC use assessments. The goal is to obtain firm estimates of use, while avoiding the expense of census. This job involves a careful, sequential execution of specific tasks, two of which deserve special attention here.

First, sound sampling decisions ensure the representativeness of the group which will provide information. Second, only valid questions receive valid answers. Getting valid answers from representative respondents is what is needed. Getting valid answers from unrepresentative respondents defeats generalizability; how broadly your results apply remains unclear. If the responding group is representative, but the answers are invalid, the quality of measurement has been diluted; whether your results and conclusion can be trusted becomes questionable. To avoid such pitfalls, sampling must be based on a population which is clearly defined and accessible. Also, the information requested must be within the scope of what respondents are capable and willing to offer.

The complexities of the sprawling, decentralized ERIC system have clearly presented a challenge to researchers who try to study it. The difficulties could be at least partially alleviated by narrower conceptualization of the studies' goals and priorities. Fry (1972) recognized that in his final report by saying, "The extent of use . . . by the total universe of users . . . cannot be estimated with . . . the present study." (pp. 1-11) Actually, we may say, chances are that no one study could assess the use of the total universe of users, as this is too global a conceptualization under present ERIC system con-

ditions. Further, major methodological shortcomings in the past have emerged in the areas of sampling, response rates, and measurement.

As Havelock (1977) has pointed out already, survey studies of ERIC since the system's inception have typically used purposive or time samples, not permitting generalization. Furthermore, if such studies attempted evaluation, they would have spoken to people already predisposed to ERIC; if they wanted to measure use, their estimates were rendered unreliable. Apart from the sample's representativeness, there is also the definition of the pool from which respondents are to be chosen. One half of the survey studies deals with educators regardless of their connection to ERIC. Thus, the emphasis of study is inadvertently placed on intended, rather than actual audiences, and amount of ERIC use may be severely underestimated. Once again, Fry (1972) warns of the consequences by saying that "the field is so vast and diverse that only gross estimates of ERIC uses can be extrapolated to an unmeasured total universe of educators." (pp. 1-11) Non-ERIC connected samples are good enough if the goal is to estimate the proportion of users in narrowly selected groups of potential audiences, as done by Denby (1974). However, if the main thrust is on actual ERIC use, then sampling must be done of the "catchment" areas where contact with users can be measured. The identified mass of users could then be broken down into more specific categories of relevance. After use and users have been dependably determined, work on non-users will be easier. Reasons for non-use, discontinuing, rejection of ERIC, could be traced, and ways to enhance the role of ERIC among potential audiences could be devised.

Unsatisfactory response rates plague even the best of survey attempts (e.g., Horne, 1976), so the reliability of their results cannot be determined. As Havelock notes, studies where mailed questionnaires result in response rates below 70% are bound to generate dubious data. Yet, such low response rates come

as no surprise, given that mailed questionnaires have been long known as the least fruitful approach to data collection. It is odd that more researchers have not tried to enhance their response rates by combining mailing with some of the known methods of boosting response. The variation in data collection approaches have been minimal, with mailed questionnaires in the dominant category, as seen in studies reported by Havelock (1977):

Method	# of Studies
mailed questionnaire	27
hand delivered questionnaire	5
interviews:	
personal	1
group	1
phone	1
observation	1
experiment	2
records	2

The seriousness of measurement problems is tied to the above mentioned methodological choices, but also to difficulties stemming from a state of affairs at ERIC system outlets. For example, in reviewing data collection methods, Havelock singled out two studies which braved data collection through records, with this comment: "Efforts to collect such data are generally reported to be hopless because of total lack of standardization in record keeping on users." (p. 16) Both Fry and Horne therefore found themselves in the difficult position of drawing conclusions based on uneven quality data -- part coming from firm records, part based on respondent "estimates". The word "estimates" means guesses offered by respondents, in the absence of systematic records or observations. The inclusion of impressionistic data can defeat the best of well-designed studies. Without belaboring the point, it is important to underscore the vast difference between survey estimates based on firm data, in contrast to data which represent "estimates . . . by library and information

staff", i.e., guesses. The former allows the calculation of probable error, the latter does not.

In another part of the larger project, Evelyn Daniel's review of record keeping patterns among ERIC outlets suggests that a problem does indeed exist. (See Appendix I.)

For example, among SOCs, school SOCs tend to keep good records on users and materials; university library SOCs keep some records on material circulation and computer searches, while BOCES SOCs typically do not keep records. This immediately suggests that the most promising SOC subgroup where use assessment could be accomplished would be school SOCs. Yet, based on current information, we are told that about 72% of ERIC SOCs are placed elsewhere -- at college and university libraries, where record keeping is spotty. So expending effort on the small group of school SOCs alone would contribute little to our knowledge of overall SOC use patterns. In the same vein, Horne's study found that 63% (n=160) of the 254 SOCs who responded to her study kept some records. Since we do not know what kind of self-selection led to these particular 254 SOCs responding, out of the totality of SOCs contacted, we cannot know what the probable record keeping proportion for all SOCs might be. The study also alludes to a further complication -- of the 160 record keeping SOCs, only 91 were willing to share their information and records; that is, 36% of all responding SOCs, or 56% of the record keeping ones, and an unknown proportion of all existing SOCs.

By contrast we see evidence of ease and detail in the EPSIS study by Wilkes (1976), when records of computer search requests were available, the time period, users and unit of analysis were clearly defined.

Given the above, the immediate concern of current assessment studies emerges as mainly one: resolving the problem of availability of uniform use data (records).

In addition, records should become somewhat more comparable from place to place. At the same time, it must be recognized that a drive for such accountability presents a delicate problem in the larger picture of library operation. ERIC is one of many tools available to patrons; as such, its role in a typical library is not necessarily central, from the point of view of library staff and information specialists. Thus, there may be practical limits to staff willingness to devote sizable amounts of time working on ERIC records.

On a broad plane, ERIC use assessments can benefit most from a programmatic, incremental approach, where consecutive studies add on to the overall use picture in a reliable manner. A regular, long-term monitoring (use) and evaluation (impact) program should be drafted and gradually implemented by Central ERIC, if at all possible. Such studies could have the following desirable attributes:

(1) Clear frame of reference, narrower conceptual definitions of user and use, with corresponding operationalization and measurement. The priority should initially fall on actual use, rather than potential or desired use, and user populations. Smaller, valid studies build a trustworthy picture faster; global, multi-purpose studies generate needs for further validations.

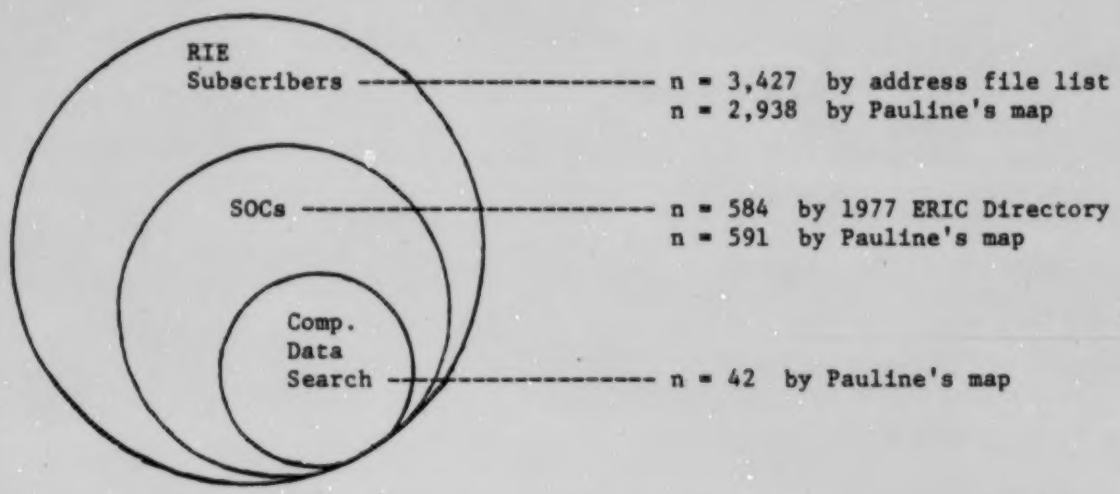
(2) Clear separation and reporting of results based on firm records from those extrapolations based on unsystematic observations, or opinion.

(3) Random probability sampling of clearly listed "populations".

(4) Choice of data collection method, or combination of methods, which enhance response rates.

II. Research Design for ERIC Use Assessments

Let us now turn to some of the concrete steps that can be taken toward assessment of ERIC use. Our focus will be on domestic SOCs and RIE subscribers. Currently available statistics suggest the following Venn diagram:



A. Augmentation of Directory of ERIC Microfiche Collections.

Additional information collected via ERIC's questionnaire for the directory is seen here as the first building block toward valid use assessment study designs. Currently, the following nine items of information are being requested:

- name
- address
- phone
- contact person
- collection status
- equipment: a. microfiche readers
  b. reader/printers
- services: a. hard copy reproduction
  b. microfiche reproduction
- charges
- access days/hours

We propose augmentation of this questionnaire by three more items of information:

1. Under "services" add c. computer base searching, and
   d. lending of microfiche readers and fiche.

2. Add a second page for a new item heading - "records of use".

Given such augmentation, the new questionnaire will consist of two pages, as follows:

Directory of ERIC Microfiche Collections

Questionnaire

Page 1

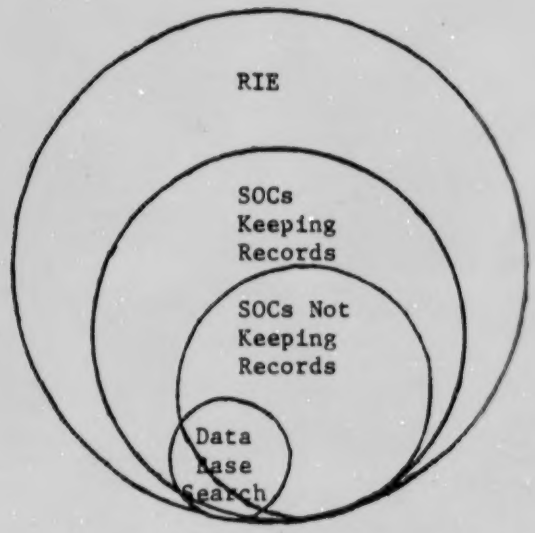
1. institution name
2. address
3. telephone
4. contact person
5. collection status (years covered)
6. equipment available
   a. # of microfiche readers
   b. # of microfiche reader/printers
7. services available
   a. hard copy reproduction ☐ yes ☐ no
      charges _____
   b. microfiche reproduction ☐ yes ☐ no
      charges _____
   c. computer base searches ☐ yes ☐ no
   d. lending microfiche readers ☐ yes ☐ no
   e. lending fiche ☐ yes ☐ no
8. days/hours available to the public

Page 2

9. records on use (see below)
10. comments

As a result, we now will have information useful both to Directory readers and for the purpose of designing assessments of system use. More specifically,

based on the augmented questionnaire data, we can take the previously mentioned Venn diagram one step further:



We propose the following items for inclusion under records on use, page 2:

9. records on use

Please indicate which of the following usage statistics you keep, if any:

# fiche circulated	☐ yes	☐ no
# fiche duplicated	☐ yes	☐ no
# paper copies made	☐ yes	☐ no
# manual searches	☐ yes	☐ no
# computer searches	☐ yes	☐ no
# orders from EDRS	☐ yes	☐ no
uses of RIE, CIJE, Thesaurus	☐ yes	☐ no
# of clients served	☐ yes	☐ no
types of clients served	☐ yes	☐ no
purpose of clients	☐ yes	☐ no

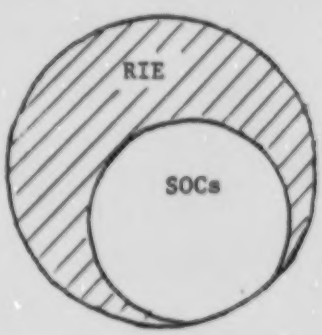
other usage records (please explain) _____

The proposed inquiry on records given above is purposely brief, as the main goal at this stage is to prepare an accurate list of the SOC dichotomy -- those with and those without usage statistics. Once completed, this phase of information gathering will serve as the basis for the SOC survey which we envision; detailed data will be requested at the time of survey implementation. The discussion of such a survey appears in later pages of this report.

B. RIE Subscriber Questionnaire.

The next step would be to turn our attention to the RIE subscribers. At the present time, we have a listing of these subscribers, but we lack much information as to their collection, equipment, or services relating to ERIC. In a number of cases we expect these to be minimal. It would be desirable to approach RIE subscribers in a manner similar to microfiche collections (SOCs). Periodic compilation of a comparable RIE subscriber directory could be the result of such an effort.

To this end, all known SOCs will be eliminated from the list of all known domestic RIE subscribers. Using Pauline's map data, this would mean that we shall eliminate the 591 known SOCs from the 2,938 known domestic RIE subscribers, thus arriving at 2,347 eligible RIE subscribers. Whenever a known RIE address is listed for more than one subscription, it will still be counted only once.[1] Using the Venn diagram again, we are now looking at the shaded population:



1. Normally, we can assume that all SOCs subscribe to RIE. However, researchers should be alerted to possible anomalies. For example, according to 1976-77 data, Arkansas had 3 RIE subscribers and 8 SOCs, which leaves 5 SOCs without an RIE subscription. The appropriate checks should be made for this and similar anaomalies at the time of any future study.

Given the above numeric estimates, an RIE directory would mean four times as many questionnaires and a correspondingly large publication, compared to the SOC Directory. Nevertheless, the purpose of contacting RIE subscribers is to establish a baseline of information unavailable previously; thus, a complete overview (census), rather than sampling, is recommended as serving the goal of full description best. The magnitude of the effort can be limited by reducing the scope of the questionnaire submitted to each RIE subscriber. Thus, we propose the following items for inclusion on <u>one</u> page:

Directory of RIE Subscribers

Questionnaire

1. Institution name
2. Address
3. Telephone
4. Contact person

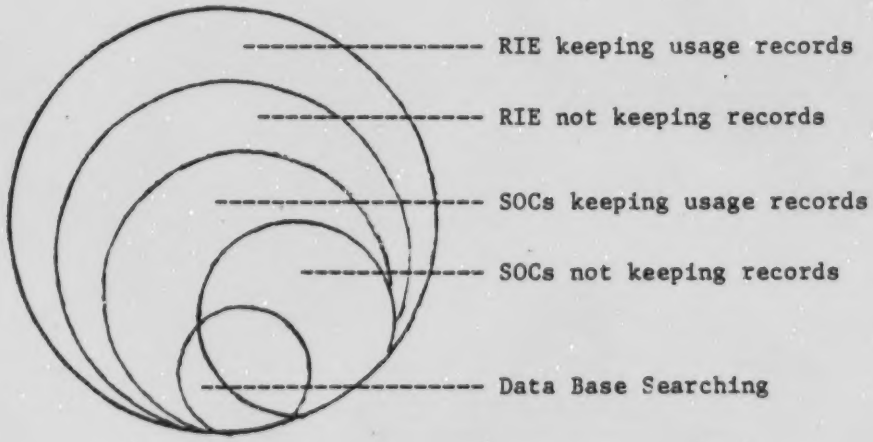
These should be printed in ahead of time, as they are known. The respondent would have the opportunity to mark any corrections or changes that might be necessary.

5. RIE subscription status (year started)
6. Other ERIC tools available:
   - CIJE ☐ yes ☐ no
   - Thesaurus ☐ yes ☐ no
7. Equipment available:
   - Microfiche readers ☐ yes ☐ no
   - Readers/printers ☐ yes ☐ no
8. Any ERIC related services (please describe): ☐ no
   _____
   charges: _____
9. Any ERIC related usage statistics you keep (please describe): ☐ no
   _____
10. Comments: _____

THANK YOU FOR YOUR TIME AND COOPERATION!

Examples can be added for items 8 and 9, if deemed necessary by the Directory project coordinator; the questions are purposely open-ended.

After all responses are received and the data properly tabulated, a more specific descriptive image of non-SOC RIE subscribers will emerge. For example, RIE subscribers could be divided into relevant groups, i.e., by availability of tools other than RIE, or equipment and services related to ERIC. Most importantly, a dichotomy based on presence or absence of records (#9) can now be generated. Again, the Venn diagram, serving as our working frame of reference, is taken still one step further:



Some surprising results may introduce changes in this scheme. For example, some non-SOC RIE subscribers may report access to data base searching.

C. Surveys on Usage.

At this point a project director may be ready to begin actual ERIC usage studies' design. This is so because, assuming that previously described steps have been taken and the designated information obtained, two important tasks have been completed:

(a) Clear separtion of ERIC outlets keeping records from those

not keeping records is now possible. This means that further down the line, reporting of results based on firm records can be separate from results obtained in non-record situations.

(b) Proper sampling and usage-specific conceptualization of ensuing surveys is also possible.

More specifically, a project director would now have the following kinds of information:

(a) # of SOCs keeping records

(b) # of SOCs not keeping records

(c) # of non-SOC RIE subscribers keeping records

(d) # of non-SOC RIE subscribers not keeping records

(e) data on what kinds of records are available (therefore, an idea as to their comparability or lack thereof)

(f) the geographic distribution for all of the above

(g) ancillary information as to the setting, facilities, etc.

As the reader may have noticed, no inquiry has yet been made as to the willingness of the record-keeping outlets to share their usage statistics. This omission has been intentional. In our opinion, steps to secure a good response rate and also to show the merits of the study -- which depends on access to usage statistics -- must be taken as part of survey implementation, after sampling. We say after sampling, because that is the time when the project director will know and be able to contact specific ERIC outlets chosen for the study.

1. SOC Usage Survey. Assuming that the above mentioned information is available, the first step is to create a double distribution map, which geographically

places the record keeping and non-record keeping SOCs throughout the USA. Then, two separate random samples are to be drawn from either population. Thus, the SOC survey would in fact consist of two substudies implemented in the same time period. Both subsurveys will in effect ask for the same information, though the item phrasing will differ, to accommodate the different record keeping circumstances. The exact random sampling procedure cannot be fully determined ahead of time, as the results of the augmented questionnaire and the dichotomy regarding records is presently unknown. However, at least two alternatives can be foreseen.

If the distribution of dichotomized SOCs is relatively even territorially, then there may be merit to proportionate sampling by state, or at least by U.S. regions. However, if the distribution is such that recordkeeping SOCs cumulate in certain areas, while non-record SOCs bunch up in others, then such proportionate sampling would be pointless. Simple random sampling may offer the best solution, should an orderly territorial pattern fail to materialize.

The size of the separate samples is also an issue for consideration. They could be proportionate in relation to the total SOC population from which the dichotomy derives. Should the two-way split prove to be extremely imbalanced -- for example, too few recordkeeping outlets -- then appropriate sampling should be chosen to ensure that the smaller sample is of sufficient size to support validity of conclusions ($n \geq 100$).

In addition, we recommend that special SOCs (EPSIS, WISE, RISE, etc.) not be sampled along with the others. Rather, they should be contacted separately during the survey (using the same approach and instrument) and the results reported as for special cases, with possible relevant comparisons vis-a-vis the rest.

We propose the following content for the survey questionnaire, designed for self-report by respondents. Note that all known information could be lifted from

the SOC directory and pre-coded on the form sent to respective institutions. A provision for correcting or updating of pre-coded information should be made.

ERIC Microfiche Collection

Survey Form*

1. Name of institution _____
2. Address _____
3. Telephone _____
4. Contact person _____
5. Type of institution:
   - ☐ College or University Library
   - ☐ Public Library
   - ☐ Information Center
   - ☐ Research & Development Laboratory or Center
   - ☐ School System
   - ☐ BOCES
   - ☐ Other (specify) _____

Please make corrections where applicable

(PRE-CODED)

6. Location of the ERIC collection materials or service: (please mark appropriate box)

	Reference Section	Microforms Section	Government Documents	Curriculum Center	Periodicals Center	"ERIC Room"	Other (specify)
ERIC Microfiche							
Resources in Ed. (RIE)							
Current Index to Journals in Ed. (CIJE)							
ERIC Thesaurus and Other Ref. Tools							
Microfiche Readers							
Microfiche Reader/ Printer or Printer							
Fiche Duplication							
Computer Searching							

*for record-keeping SOCs

7. How would you characterize the placement of ERIC materials and services at your institution:

- ☐ consolidated in one location
- ☐ located within brief walking distance
- ☐ dispersed
- ☐ other (explain) _____

PLEASE FILL IN USAGE STATISTICS FOR THE PRECEDING YEAR (12 months) IN THE CATEGORIES APPLICABLE TO YOUR ERIC FACILITY.*

8. Services and materials:

- # fiche circulated _____
- # fiche reproduced _____
- # paper copies made _____
- # manual searches _____
- # computer searches _____
- # orders from EDRS _____
- # uses of:
  - RIE _____
  - CIJE _____
  - Thesaurus _____
- # IAPs circulated _____
- # equipment loans _____
- # questions _____

9. Mode of service requests:

- # or % in person, walk in _____
- # or % by telephone _____
- # or % by mail _____

10. Total # of clients served _____

11. Types of clients served:

- # elem/secondary school teachers _____
- # elem/secondary students _____
- # administrators (K-12) _____
- # school librarians, media specialists _____
- # ancillary staff (counselors, etc.) _____
- # school board members _____
- # BOCES staff _____
- # college faculty _____
- # college administrators _____
- # graduate students _____
- # undergraduate students _____

*In case your records cover a different time period, please so indicate. Leave blank categories which do not apply to you.

community individuals _____
government (local, state) agency staff _____
others (specify) _____

12. Purpose of clients served:

elem/secondary instruction _____
college instruction _____
elem/secondary school work _____
college course work _____
theses and dissertations _____
program development _____
curriculum development _____
proposal development _____
administrative planning _____
personal/professional development _____
other (specify) _____

13. Do you promote or advertise the availability of the ERIC facility?

☐ yes ☐ no

In what manner?

☐ handouts or brochures
☐ displays
☐ orientations and seminars
☐ library tours
☐ personal contact
☐ audiovisual materials or presentations
☐ other (specify) _____

14. Do you provide user orientations to ERIC?

☐ yes ☐ no

In what manner?

☐ chalk talk or lecture
☐ tour of ERIC facility
☐ handouts or brochures
☐ audiovisual materials or presentations
☐ other (specify) _____

15. Do you have signs guiding users to the various parts of your ERIC facility?

☐ yes ☐ no

16. Would you be willing to help Central ERIC prepare a standardized SOC record-keeping format sometime in the future?

☐ yes ☐ no

17. If Central ERIC prepared such a common SOC record-keeping form, would you be interested in using it?

☐ yes ☐ no

The non-record keeping version of the above questionnaire would employ a different wording for the heading which preceds usage items (#8, 9, etc.):

PLEASE ESTIMATE THE APPROXIMATE USES OF YOUR ERIC FACILITY DURING THE PRECEDING YEAR (12 months) IN THE FOLLOWING CATEGORIES:

(Same categories)

A footnote should be added: "If monthly or quarterly estimates are easier for you, please provide these, so noting."

III. Comments

The preceding 12 months' period for usage statistics will be kept comparable among respondents through survey timing (say, January of year 19xx) and phone discussion with the SOC contact person, if necessary.

The data collected in the above described manner show use measure along the lines of several critical variables. The amount of specific uses and number/types of users will be found to the extent allowed by the records and estimate circumstances. Also, an important indication of SOC receptivity to the idea of standardized record keeping will be obtained.

Ironically, the non-record keeping SOCs may come up with fewer blanks, as they are not constrained by the absence of records in providing estimates. Thus, the non-record keeping SOC's responses may appear more information-rich. It is up to the project director at the time of such a survey to consider the desirability of providing estimate options to the record-keeping respondents.

Special care should be taken to combine the questionnaire distribution mode with additional steps enhancing response rate. Under no circumstance is the SOC

survey to be implemented as a "mailed questionnaire only" study, given the dismal response record of previous attempts.

Again, the precise steps taken should be left to the discretion of the project director, because what can be done would depend on the time frame, resources, and cost limitations. However, there are many possibilities:

(a) advance telephone discussion with contact persons of sampled units; phone contact renewed prior to questionnaire pick-up

(b) provisions for hand delivery of questionnaires, with repeats, if needed

(c) provisions for various pick-up modes, instead of sole reliance on mailing

(d) a clear deadline for responses; provision for reminders, explanations, clarifications, etc., during the response time period

(e) use of local facility personnel as project facilitators

(f) consider giving contact persons some form of assistance in compiling the necessary material/data, filling questionnaires, etc.

Similarly, remember the need for steps to secure data from SOCs unwilling to share their information.

Finally, special care should be taken in data analysis, bearing in mind that at this time records would still be non-comparable in many cases.

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APPENDIX III

Level III ERIC Usage Study

ERIC "Impact Studies": Methodological Recommendations for Future Research and a Review of Previous Work

by Jeffrey Katzer*

ERIC is an information system and as such it can be monitored and studied in terms of its information functions, its products and its services. This paper will focus on ERIC impact studies -- how ERIC products and services have affected the end-user. First some general methodological recommendations will be made about studies in particular. These recommendations are not exhaustive -- there are too many one could make. Rather, my hope is to identify a few important recommendations which, in general, may not have been applied. Second, all available ERIC impact studies will be analyzed in terms of these recommendations and in terms of the specific impact measures employed. And last, a few more specific research plans for future impact studies will be included.

I. Methodological Considerations and Recommendations

Proper methodological procedures to apply in ERIC impact studies should be based upon the basic principles of scientific research. It is obviously impossible to present all of that material in this paper. Those few principles which are included have been chosen because they are very important and they have often been omitted from ERIC impact studies as well as from investigations of other information systems. These recommendations are suggested as guidelines of "first choice". Occasionally, practical constraints may prevent their utilization and in some situations other procedures may do as well or almost as well.

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*I would like to acknowledge the assistance of Professors Pauline Atherton and Bissy Genova who reviewed an earlier draft of this paper.

In any empirical study of ERIC impact (in fact, in all empirical studies in all of the sciences) the investigator has two ultimate concerns or questions: (1) to what extent are the data collected accurate and free from distortion, and (2) to what other units, situations, and measurements do the results apply? The first is called the question of trustworthiness, the second is the question of generalizability.

A. Experimental Research Designs.

A well-conducted true field experiment is the single best method for assessing the impact of ERIC on the professional lives of the end-users. All non-experimental approaches (including surveys) are suspect because they permit alternative explanations of the observed findings.

The defining characteristic of a true experiment is the use of random assignment of the units being studied (end-users) into two or more groups. Random assignment is the best known way to initially equalize two groups of end-users. If only one of these groups is allowed access to an ERIC product or service, any differences observed between the groups can be attributed to that product or service. The second requirement of an experimental impact study is a change in the lives of one group of end-users: initially these end-users cannot avail themselves of the product or service in question (later they may be permitted to do so). There are two general approaches for effecting this change: (1) choose end-users and withhold some existing ERIC product or service from a random half of them, or (2) wait until ERIC modifies some policy, procedure, or product and only permit a random half of the end-users to be affected by, or to make use of, the change.

1. Procedure. Whenever changes are contemplated in ERIC policy, procedures, or products an experimental plan to assess the impact of these changes on the

end-user would require the following four steps.

1. Randomly divide the current and potential end-users into two groups: those who will not see the proposed change (at least for the duration of the study), and those who will see or come in contact with, or be subject to, the proposed change. For practical considerations, it may be necessary to confine this division to the end-users of one or more Clearinghouses (CHs) or SOCs (Standing Order Customer of ERIC Microfiche), but it is essential that whatever group of end-users is involved in the study, the division be completely at random -- say with a flip of a coin.
2. Make or permit the proposed change available to one group of end-users and withhold the change from the other group.
3. Devise an instrument to measure the impact of the proposed change. Try to have all end-users, or a large random sample of all end-users of both groups complete the instrument.
4. Tabulate the results and compare the two groups. If carefully conducted, the results present a strong case for the impact of the proposed change as compared with the current situation.

For those situations in which it is impractical to randomly divide the end-users, it may be possible to randomly divide the CHs or SOCs and treat all end-users within each CH or SOC similarly. For example, it might be difficult to make some products or services available to only some end-users of a CH or SOC and withhold it from others, but it would be acceptable to make these products or services available to all end-users of some CHs and withhold it from the others.

To analyze this as a true field experiment, an alternative set of four steps need to be followed.

1. If all of the SOCs are going to be involved in the study, there are enough of them to employ simple randomization. That is, divide the SOCs randomly into two equal-sized groups: those SOCs that will and those that will not be given the proposed change. However, if CHs are to be studied, or if only a few of the SOCs are to be included, a more complicated procedure is recommended. To help compensate for the f[illegible]umber of units (SOCs or CHs) matching needs to be used in conjunction with randomization. Matching is potentially troublesome and care is needed when carrying it out. An acceptable set of matching procedures are:
   (a) Identify one or more matching variables -- those measures which are available and can be used to compare the units (SOCs or CHs). Ideally, the choice of measures should depend upon factors which differ among the units but are related to impact. Some possible matching variables are geographical location, size of collection, number of users served last year, or number of years in existence.
   (b) List all of the units in descending order according to their values on the matching variables.
   (c) Divide the list into pairs by drawing a line after every two units.
   (d) With a flip of a coin, assign one unit from each pair into one group and the other unit into a second pair.

(e) Never discard a unit from the list because it doesn't match very well with its paired unit. If one or more units need to be discarded, do this first (before step a) and if possible, randomly choose which units are to be discarded.

2. Make or permit the proposed change available to one group of units and withhold it from the other group. This choice should also be determined randomly.
3. Devise an instrument to measure the impact of the proposed change. Try to have all end-users, or a large random sample of all end-users from each unit complete the instrument.
4. For each unit, convert the responses from the individual end-users into a single measure such as an average. Compare the two groups of units by analyzing these two sets of averages. Strictly speaking, because randomization was applied to the units, this can be considered a true experiment only if the conclusions are applied to the units (i.e., SOCs or CHs) rather than to the end-users.

A single, well-conducted true field experiment will satisfy the question of trustworthiness. To answer the question of generalizability, further studies will be needed if all potential end-users were not eligible to participate in the study. But a trustworthy answer to a study of limited generalizability is often preferable to a less trustworthy answer from a broader population of end-users.

2. Objections. When true field experiments have been recommended to policy makers and administrators, two objections are frequently raised.

1. True experiments require that some units (end-users) be denied the proposed change. Since the change would not be recommended unless it was believed to be better than the current situation, it would be unethical tc conduct an experiment and deny anyone what is thought to be a better treatment, service, or product.
2. Experiments in laboratories are straightforward and do-able, but in the real world it is usually impossible to divide the units randomly.

In rebuttal, the rollowing arguments are presented.

1a. Unless one conducts a true field experiment, the results of the study will be inconclusive and other studies will be needed. It is very often the case (see Gilbert, Light, & Mosteller) that investigators cannot obtain a trustworthy assessment of the impact of a proposed change -- even after several non-experimental studies have been conducted. Therefore, it may be equally unethical not to accurately answer the question of the effectiveness of the proposed change as quickly as possible. To do otherwise may be viewed as "playing with the end-users", as wasting resources, or as preventing alternatives from being considered because of the investment and commitment to the change already implemented. Moreover, a statistical artifact of some non-experimental studies may lead to erroneous conclusions, viz, that the existing policy or procedure is better than it really is. With such distorted data, administrators may

continue to support ineffective programs.

1b. With regards to ERIC it is doubtful that denial of the proposed change in policy or procedure will be as harmful as say the denial of a new medical treatment to seriously ill patients. Moreover, the denial of the proposed change is not permanent -- it need only continue for the duration of the study. With little additional effort, corrective action can be taken after the study has determined whether or not the proposed change is, in fact, an improvement. Those end-users in the "poorer" group can be given the opportunity to make use of what was available or permitted in the "better" group. In fact, if the impact study leads to an improvement in ERIC then those in the "poorer" group may profit from the study by being able to avail themselves of the changed system.

2a. While it is easy to conceive of the situations in which true experiments cannot be carried out -- as in the measurement of some ongoing, unchanged operations -- true field experiments are possible more often than might be believed.

ERIC impact studies deal with the effect of a service or product given to an end-user. If a product or service can be given, it can also be withheld. So at least potentially, one of the requisites needed for randomization exists in most, if not all, impact studies.

This is important to emphasize because the step-by-step experimental guidelines above have dealt with only one way to effect a change in the end-user, by changing ERIC. This is not a requirement for an experimental impact study. The re-

quirement is to effect a change in the life of the end-user, and as mentioned above, this may be accomplished by withholding services instead of by changing ERIC.

There are other indications (see also Cook & Campbell) which suggest that randomization may be possible. Whenever the number of requests for a specific ERIC product exceeds the ability of the system to supply that product, the choice among requestors can be made randomly. Or, in more general terms, whenever a proposed change is difficult, expensive, or time-consuming, it cannot usually be implemented all at once everywhere in the system. A random implementation plan will allow true field experiments.

One potential difficulty with field experiments is contamination between those who are to receive the proposed change and those who will not. This problem is alleviated somewhat whenever the experimental units (end-users, CHs, or SOCs) are unknown to each other or are separated spatially or temporally. Since this describes many ERIC end-users (and some CHs and SOCs as well), true field experimental impact studies of ERIC are an even more attractive alternative.

2b. Many true field experiments have been conducted in medicine (which may seem to be more amenable to laboratory-like procedures), in criminal justice (e.g., who should be required to pay bail), in education, in welfare reform, in television advertising, and in other areas. It is difficult to imagine that they would be impossible to conduct in other areas, such as in ERIC impact studies.

Some manufacturing plants use a quality control proce-

dure called EVOP (evolutionary operations). It is an experimentally based procedure built into the everyday production process. By means of EVOP, changes are made on a regular and systematic basis to continually improve the cost-effectiveness of the product (see Box and Draper).

In addition to these two general objections, impact studies of information systems suggest another, more specific objection.

3. True field experiments are so rich with uncontrolled stimuli and the measures available to assess impact are so weak, that any real difference in impact between the two groups of end-users will not show up in the results. The true results will be either hidden in the noise of the other stimuli, or not measured with instruments sensitive enough to discern them.

Without denying the premises in this objection, it should be noted that,

3a. Many non-experimental studies of ERIC have contained some assessment of impact. These studies used impact measures which differentiated among classes of people (such as users and non-users). Because the only key difference between these studies and true field experiments is how people become members of the user or non-user group, there is every reason to believe these same measures can be used in experimental studies of impact.

B. Other Research Designs.

True field experiments should be the first choice of a design for ERIC impact studies. And as the previous section argued, such designs are possible

more frequently than might first be believed. Sometimes, however, randomization will be impossible, precluding true experimentation. In such situations what alternatives are there?

In this section four different research designs will be considered. None of them is truly experimental; they all have some problems satisfying the question of trustworthiness. Furthermore, they are not equal alternatives -- the first is completely unacceptable and is presented because it provides a basis for discussing the other designs, and because it underlies some existing usage and impact studies. The other three designs, while acceptable, are not equivalent to true experiments and I hope that this presentation will not make it easy for a researcher to give up, prematurely, the possibility of conducting a true field experiment. The three acceptable designs will be presented in order of increasing cost and increasing trustworthiness; the better designs also cost more to conduct.

Two brief points need to be mentioned before beginning. First of all, these four designs require that measures of impact be obtained before the proposed change is implemented as well as afterward.* This implies some amount of planning and coordination between the researcher and ERIC because the researcher needs forewarning in order to collect the "before" measures. Or it imples that suitable impact measures are obtained from end-users on a regular basis so that when a change is implemented, the "before" measures already exist. Naturally, it is essential that the before measures be comparable to those collected after the change is implemented. This is not a novel suggestion; for example, essentially the same point is made as the first general recommendation in Fry's massive study of ERIC usage.

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*Notice that the type of true experiment described earlier does not require any before measure of impact.

The second point is the need for making comparative judgments of impact. There are few, if any, absolute measurements, possible in the study of information systems. Impact is interpretable only in relative terms -- in comparison with some standard. Two types of comparisons are possible: (1) comparisons among measures of impact taken at different times from one group of end-users, and (2) comparisons between two groups of end-users -- those who were permitted to be affected by the change and those who were not so permitted.

The four designs presented below differ in terms of how many before and after measures are taken (either 1 or several), and in terms of how many groups of end-users are studied (either 1 or 2). As an overview, and with some slight risk of misclassification of their relative values, the four designs can be considered as follows.

Design	How Many Before and After Measurement Periods	How Many Groups of End-Users	Level of Trustworthiness
I	1	1	unacceptable
II	several	1	acceptable
III	1	2	better
IV	several	2	best

Design I is quite simple. Collect impact measures from a sample of end-users before the change is implemented and repeat the process after the change. In any study of people, this is a particularly weak design because it is almost impossible to correctly attribute any differences between the two sets of measures to the change (see Katzer, Cook, & Crouch, chapter 11). Unfortunately, it is frequently employed by managers and administrators to deter-

mine the effect of a change in policy or procedure. Usage studies in information systems are especially vulnerable; the manager compares the previous set of usage figures with current data and attributes the difference to some specific change which occurred in the interim. This design should not be used.

Design II is much better. By making use of several before and after measures, a careful researcher is more able to identify the effect of the change on the end-users. It is important that the different measurements be the same or comparable -- the same instruments and observations taken from comparable samples of end-users. Either the same group of end-users can be measured every time (as in a panel study), or different random samples of end-users can be employed. Each alternative has its attractive features and its liabilities. The panel study is subject to systematic "dropping out" of participants, biasing the panel and possibly causing whatever differences are obtained between the before and after measures. Use of different random samples eliminates this problem, but prevents any assessment of the long run effect (impact) on individual end-users. Analyzing the results of this design is not straightforward and will require some expertise in statistical techniques (see Glass, Willson, and Gottman).

Design III needs to be described in more detail. It requires two groups of end-users: the members of one group are able to avail themselves of the change, those in the other group are not allowed to do so. This design differs in three important ways from the first true experimental design described earlier: (1) Design III requires one set of before measures from both groups of end-users; the experimental design did not use any before measures. (2) Design III can use intact collections of end-users -- such as two SOCs; the experimental design requires that the groups be created through randomization.*

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*The alternative true experimental design presented earlier makes use of intact units also. The fundamental difference between the alternative and Design III

(3) Design III uses a coin-flip to decide which group is to be given the change in procedure or policy; the experimental design uses a coin-flip to decide group membership for each end-user.

Design III can be implemented in the following manner. For the purposes of simplifying the presentation, only two units (naturally occurring collections of end-users) will be considered.

1. Identify the two units. Ideally, these should be as similar as possible in terms of all measures related to impact. And therein lies most of the difficulties with this design. If the two units are selected because of availability or by administrative ruling, they may not be similar enough. If the researcher is permitted to choose among several available units those two which are most similar, the selection procedure itself may decrease the trustworthiness of the findings. To avoid, but not prevent, the latter problem, the before measures should <u>not</u> be used to find similar units, nor should any end-users be discarded from a unit in order to improve the degree of similarity.
2. Make or permit the proposed change available to one unit and withhold it from the other unit. The choice between units should be determined randomly if possible.
3. Devise an instrument to measure the impact of the proposed change. Try to have all end-users, or a large random sample of all end users from each unit complete the instrument.

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has to do with the conclusions. The alternative true experimental design must have many units and the results apply to units. Design III only needs two units (it may have more) and its results apply to the end-users.

4. Tabulate the results and compare the two sets of end-users. If the two units were similar enough on all essential variables, then any difference in impact between the units can be attributed to the change.

Design IV combines the attributes of Designs II and III; there are two units of end-users and each is measured several times before and after the change is implemented. As before, it is important that the two units be similar and it would be helpful if the choice between the units (which is to receive the change) be determined randomly.

C. Measurement Considerations.

These include who to measure, how to measure them, and what to measure. These are general recommendations -- specific impact measures are discussed later in the paper.

1. Obtain micromeasures as well as macromeasures. King and Bryant distinguish between these as follows. Macromeasures are aimed at determining the total impact of the information system or a component of that system. On the average, how well is it functioning? How effective is the information system?

Questions of turn-around time, accuracy of information, timeliness of information, coverage of collection, form of output, and cost are some common macromeasures. They are at the macro-level because an aggregate conclusion is made about the average response or the general tendency.

Many investigations of information systems deal only with macromeasures possibly because they are easier and less costly to obtain. But the improvement of any operation depends upon the incremental elimination of failures (instances of poor performance). Micromeasures are a study of individual failures. Why did this particular unit have such poor performance? Why was turn-around time

so long? Why was it more costly than others, etc.? By examining each instance of failure it is possible to determine if the situation was atypical and ought to be ignored, or if it can be traced back to the same source as other failures -- in which case remedial action needs to be taken.

When impact is being studied there are several major potential sources of failure and it will often be difficult to reliably determine the source of those failures.

-- collection failures: the selection or production of ERIC products, the coverage of the data base, the accuracy and recency of materials, etc.
-- organization failures: the arrangement and classification of products
-- delivery failures: the availability of products and services and the timeliness of their delivery to the end-user

2. Measure non-users as well as users. There are two concerns here. First there is the question of frame of reference. If ERIC is the focal point, the investigation is of users and their role, reactions, behaviors, etc. as a component of ERIC. This frame of reference, while valid and often useful, is limited. It cannot deal with educators who obrain ERIC materials indirectly; it precludes a microanalysis of non-users -- are they "failures" of promotional materials, of accessibility and location of the SOCs, or of pricing structure; and it eliminates any direct comparison of ERIC users with non-users -- which, if systematic differences were found, would certainly affect any conclusions drawn about the impact of ERIC.

The alternative perspective, though more costly to implement, is recommended. It has people as the focal point and determines the role and impact of ERIC in

their professional lives.

The second concern is an old one, but well worth repeating even though most ERIC impact studies avoided the problem. To study users one must deal with real users, not surrogate users such as experts or judges. Surrogate users can judge impact, usefulness, quality, or relevance in a very limited sense. Moreover, surrogate users have a difficult time interacting with ERIC which also limits the usefulness and applicability of the obtained data (see D. Swanson).

And finally, it should be pointed out that a comparison between users and non-users, while recommended, cannot adequately serve as a substitute for a true experimental design. True experiments require "identical" groups for comparison. Since people select themselves into a user or non-user category, these groups are rarely identical.

3. Obtain trustworthy measurements. To obtain reliable and valid measures careful preparation, training, and pretesting are essential. Using several measures rather than one will help, as will unobtrusive measurement.

The vast majority of ERIC impact studies make use of questionnaires or interviews. The specific wording, format, and order of each question or item can potentially affect the response or the investigator's interpretation of the response (see Noelle-Neumann).

One common example of invalid measurement in the study of information systems occurs when the investigator asks potential users their needs, but gets instead their expectations. Frequently used technical terms are often ambiguous to respondents lowering both the reliability and validity. Of particular concern are terms like "usefulness", "satisfaction", and especially "relevant".

Researchers should also be wary of using the general global opinions of end-users as a major impact measure. Carefully measured opinions can provide

some clues as to overall functioning of the system, and each end-user's response can be analyzed as a micromeasure. But a major weakness of such opinions is that they may bear no relationship with the quality or impact of the system -- participants, respondents, and end-users are likely to be quite favorably disposed toward ERIC even if a more objective approach identifies serious weaknesses (see C. Weiss, p. 41). The safest way to interpret the opinions of end-users is by comparing them with a suitable comparison (such as in an experimental study).

ERIC impact studies often need to focus the end-user's attention on the past: questionnaires and interviews ask about prior usage and the impact of that usage. General questions of this sort can provide trustworthy information only if the end-user's memory is accurate. That is not usually a safe assumption. To minimize this problem, it is helpful to focus the end-user's attention to a specific, recent interaction with ERIC and frame all questions in terms of that "critical incident".

While single measures which are highly reliable and valid are desirable, they are often hard to find. Another approach (which should be used in conjunction with the improvement of each measure) is to use several related measures and look for some commonality in response. Several measures which agree are clearly more trustworthy than a single measure. Though it helps to ask the same impact question of ERIC users in several different ways, it is still better to base an investigation on behavioral as well as verbal responses.

-- Did potential users report that ERIC has an impact on their professional lives (verbal)?

-- Did potential users demonstrate that ERIC had an impact on their professional lives (behavioral) by using ERIC products

or services (e.g., citiations in articles written by the user, change in teaching practices in the classroom, etc.)?

Another advantage of some of the behavioral responses is that they may be observed unobtrusively -- without the user knowing they are being observed. If the process of measurement does not impinge on the user it cannot distort the findings. Checking citations for sources provided by ERIC is an example of unobtrusive measurement.

II. Measures for ERIC Impact Studies*

While there are hundreds of measures proposed or used in the assessment of the performance of an information system, there are very few commonly used measures of impact. It is clear from the literature that the state-of-the-art of impact measurement is still in its infancy. Part of the difficulty has to do with the subjective, non-quantitative nature of impact assessment. And part of it has to do with the fact that practically all of the other measures used in system assessment are irrelevant (or almost so) to impact. For example, in a study of the performance of an information system, accuracy measures based on relevance (e.g., recall and precision) will usually matter. However, in an impact study of the same system, end-users may find the retrieved information to be useful, helpful, and having an effect on their professional lives regardless of the relevance of the retrieved documents in terms of their original information needs.

In measuring impact, it is important to keep in mind that ERIC end-users are like everyone else -- they are not always systematic in their searching behaviors, they often change what they want and what it is wanted for, and they are quite willing to follow an unexpected information path if it looks interesting

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*I am indebted to Professors Michael McGill and Judith Tessier for their assistance in the conceptual development of this section.

or promising (see Taylor; Dervin). This suggests that what seems to be a logical impact measure may not be. For example, a citation count of an educator's use of ERIC documents may only be an impact measure in the very weakest sense. Such behavioral indices need to be substantiated with some assessments of how the citations helped the educator.

After reviewing what little literature there is on impact, three somewhat overlapping measures stand out: savings, novelty, and uses. Before considering each of these individually, two reminders seem appropriate. First of all, ERIC affects not only those educators who interact directly with the system at its official outlets (e.g., SOCs, CHs, EDRS), but also those educators who obtain ERIC materials or benefits from ERIC services indirectly (e.g., from other educators). Impact studies should include both types of end-users. Secondly, the impact of an information system may be quite a bit more than the sum of the impacts of each information item. ERIC users may interact with an intermediary and refer to the thesaurus before obtaining documents. Each of these contacts can affect the user in some meaningful way, and a thorough impact study should include the end-user's total interaction with ERIC.

A. Savings.

One type of impact is evident if an ERIC product or service can be shown to save users time or resources. It is difficult to obtain any objective measure of such savings. Cooper's "naive methodology", though difficult to implement in practice, is in principle on the right track. He suggests that users be asked to estimate the value of each document produced by the system and quantify that value by assigning an amount in dollars (which may be positive, negative, or zero). The user judges each document in the order in which they appear from the system; if the user changes his mind about the topic, if he

stops before considering all of the documents, if a later document duplicates the information in an earlier one -- if any of these rather common events occur, they will be reflected in the dollar estimates.

Dollar estimates for each document can be summed to obtain a measure of the utility of the total search interaction. By comparing these values with those obtained from alternative versions of the information system, Cooper hopes to obtain a useful measure of system effectiveness.

The "naive methodology" can be extended to assess impact. Users can be asked to estimate the dollar savings which might result from making use of the information in each document. Or they could estimate productivity changes or time savings, and transform these into dollar amounts.

Such subjective judgments need to be interpreted carefully. One approach which will help is the use of a comparison group -- by comparing the subjective dollar impact judgments between the groups, biased estimates of the difference in impact between ERIC and an alternative source. It would also help if each user is asked to focus on a specific education problem or project and describe in some detail where the savings are to come from.

Savings in time can be assessed in a similar manner. However, a true field experiment with several "after" measures will provide a more objective measure of one aspect of time savings: not savings on the job, but the amount of time ERIC saves in locating information products. By comparing ERIC users with non-users periodically over several months, one could learn how long it takes the non-users to "catch up" with users in terms of their knowledge of, familiarity with, and use of various information sources and products.

Some discussions of impact measures propose that avoiding duplicating previous research is a type of time savings. Though this will save the user time, it has questionable impact on the profession as a whole. Education, like many

of the applied social sciences, needs more research replications, not fewer, if it is to be able to separate those research results which are correct and should be believed from those results which were due to chance events or poor methodology.

B. Novelty.

This may be a misnomer. Among the traditional measures of information system effectiveness is the novelty ratio: the percentage of retrieved information items which the user has not seen before (see Lancaster). What I have in mind here includes this notion of novelty, but as one aspect of something more general. Son Swanson, Robert Taylor, and others have compellingly argued that for many, if not most, interactions with an information system, a major beneficial effect on users is how these interactions cause the users to reconceptualize their problems. To repeat Swanson's theme, when users interact with an information system they are engaged in a trial-and-error process. They begin at a relatively fixed place (in terms of their information background and need) and have some initial idea of where they want to go. But the path between them is rarely straight. Users try one route and then another and when they stop, usually they have changed, their understanding of the path to the goal has changed, or the goal itself has changed. These changes should not be considered detours toward a fixed goal; rather, the detours are an intrinsic part of the goal.

Systems which expose users to unanticipated, but useful information are valuable and anything the system can do to assist the user in this regard is welcome. The frequency and significance of each novel information item and each unexpected detour needs to be considered in any assessment of the impact of an information system.

Ease-of-use and response time are two performance criteria which provide an indirect (perhaps unobtrusive) measure of novelty. They are an indication of the system's capability to interact rapidly and easily with the end-user; the greater the capability, the easier it is for the user to explore new paths and take unexpected detours.

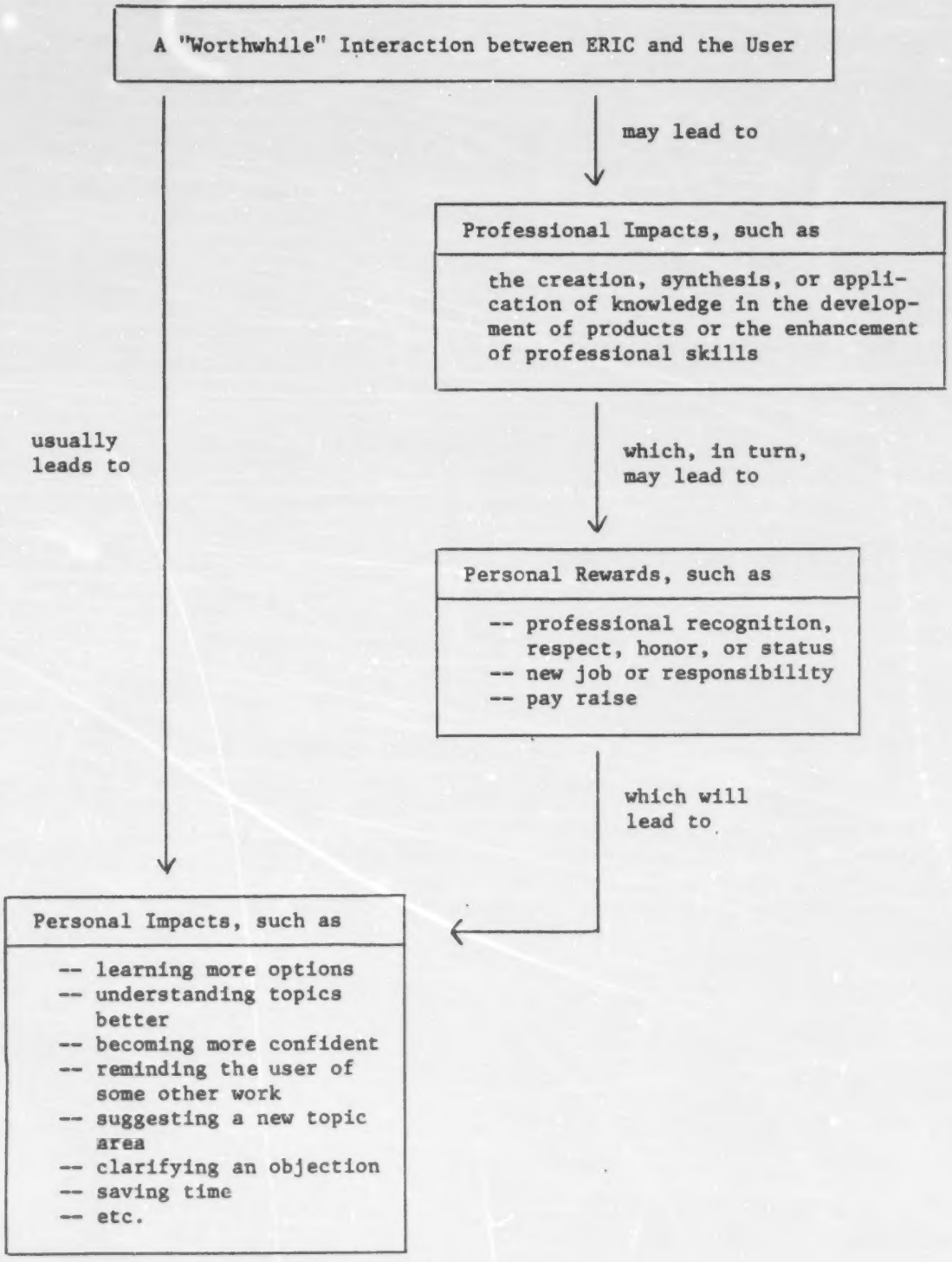
C. Uses.

ERIC may assist a user to complete some product (e.g., a speech, journal article, curriculum guide, etc. -- see Ely & Atherton) and these products per se may be considered as evidence of impact. However, a study limited to products will not tap all (or even most) manifestations of impact.

ERIC can also assist users in skill development (e.g., improved ability to construct a budget or teach a class). And an even more general, but less tangible measure of impact is how the interaction with ERIC helped the user (see Dervin; Zweizig). An advantage of focusing on the "how" question rather than the "what" question (i.e., products and skills) is that the former includes impacts for which there is no immediately observable product or change in performance.

A positive interaction with ERIC will always lead to one or more personal impacts (i.e., "how" it helped the user); it may also lead to a professional impact, which in turn affects the user on a more personal level. This can be portrayed as follows.

IMPACT OF ERIC ON THE USER


A "Worthwhile" Interaction between ERIC and the User
may lead to
Professional Impacts, such as
the creation, synthesis, or application of knowledge in the development of products or the enhancement of professional skills
usually leads to
which, in turn, may lead to
Personal Rewards, such as
-- professional recognition, respect, honor, or status
-- new job or responsibility
-- pay raise
which will lead to
Personal Impacts, such as
-- learning more options
-- understanding topics better
-- becoming more confident
-- reminding the user of some other work
-- suggesting a new topic area
-- clarifying an objection
-- saving time
-- etc.

D. An Approach for Measuring Impact.

Impacts on the profession are relatively easy to measure, but a study of the effect of ERIC on the end-user ought to go beyond a simple count of publications, speeches, and the like. What is needed is a measurement procedure which can reliably determine the more personal consequences of the interaction. Notice that within the scope of what I have called "personal impacts" are examples of all three classes of impact measures: savings, novelty, and uses.

Dervin has developed an interview procedure which helps elicit uses and the personal consequences of those uses. Though it can be easily adapted for use in an ERIC impact study, the method requires extreme care in questionnaire preparation and interviewer training. The method can be roughly outlined as follows.

1. Obtain a sample of education professionals and other potential ERIC users. In a survey it will be important that the sample be representative. In a true field experiment representativeness, though valuable, may be compromised in order to obtain a comparison group. Notice that the focus is on the person and not on ERIC. Consequently, the sample will include both users and non-users.
2. Interviewers ask each respondent to identify a recent, salient problem, worry, or concern of a professional nature -- something like, "As a professional, what's bothering you?"* At this stage of the questioning it is important to focus on the problem and not on ERIC. In fact, it may help if ERIC is not mentioned until the end portion of the interview.

   The problems (or worries or concerns) can still be unre-

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*Exact phrasing of the questions can be obtained in Appendix D of Devin's report.

solved or they may have already been resolved. What matters is that the respondent can recall the problem in some detail.

3. All important aspects of the problem are then listed in chronological order. This take is aided considerably by dividing it into a few separate steps. First ask the respondent what single thing is best remembered about the problem situation. Then ask for all events which preceded that one, and then all events which follow it.

4. Respondents are asked to identify those things they wanted to learn more about as they dealt with their problem situation. Reviewing each of the problem steps will help the respondent recall what information was sought or what he tried to learn more about or understand better.

5. Then for each thing they tried to find out about, the respondents are asked:

    (a) How did they try to find out about it?

    (b) Did they succeed in finding out about it?

    (c) If so, did it help (i.e., did finding out help the respondent deal with his professional problem, worry, or concern)?

    (d) If it helped, how did it help?

    (e) If it did not help, why not?

Questions (a), (d), and (e) are open-ended; there is not any checklist nor any mention of ERIC. Analyzing the responses to these questions requires some diligence. Dervin's content analysis categories are a good place to start, but they will need to be changed somewhat to include ERIC and alternative information sources available to professionals in education

and related fields. Question (d) is the "how" question for personal impact. And question (e) provides micromeasures for a failure analysis.

6. Later in the interview respondents can be asked specific questions about ERIC and the role it plays in their professional lives.

III. A Review of ERIC "Impact Studies"

The research design and measurement criteria described earlier are recommendations for the conduct of idealized impact studies. Though it has been argued that most, if not all, of these recommendations are practical and can be implemented, it remains to be seen if they have been implemented. That is, what is the extent to which they have been used in existing ERIC studies?

In 1977 Havelock examined 31 empirical investigations of ERIC. A careful search of the literature uncovered an additional 40 studies. Of this total, 10 could not be identified* and were dropped from further consideration. After examining the other 61 studies it became apparent that the assessment of impact has never been a major thrust in investigations of ERIC -- 45 studies did not consider impact at all and these were also eliminated.**

The remaining 16 studies constitute the sample of "impact studies" reviewed here. Citations to these studies are given in Appendix A. Though a serious attempt was made to locate all ERIC impact studies, some may have been overlooked. The information and examples taken from this small sample of studies may be representative of the state of practice of impact assessment, but that claim cannot be strongly supported by the available evidence.

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*Havelock's article is still in the draft stage and the very brief citations to the ERIC studies included in that draft are not sufficient to locate these 10 studies.

**Susan Mount was very helpful in the preliminary screening of these studies.

A. Research Design and General Measurement Considerations.

Because the 16 studies considered impact only peripherally, as a relatively small part of the overall research project, it would not be justifiable to strictly judge them in terms of the recommended criteria. General characteristics of these studies, in terms of research design and measurement, will be briefly noted. Since none of the studies were solely concerned with impact and many of the studies used more than one methodological or measurement approach, the total number of studies which followed, or did not follow, recommended procedures may not be meaningful.

As might be expected, none of the 16 studies was a true field experiment. The majority (14) were surveys of one form or another (e.g., mail, personal interviews). These surveys differed markedly in quality. One indication of this is the range of response rates, from a low of 33% to a high of 94%. The other two studies were more like case studies and had, therefore, many of the problems of the first (unacceptable) alternative research design described in Section I-B.

Half the studies used micromeasures as well as macromeasures. Some sample items are:

-- "On the back side of this page, would you briefly discuss why you believe ERIC products and services are/are not useful to teachers. Why are they not used more? In what ways could ERIC be improved?" (Shanklin)

-- "The following is a list of problems that may have arisen with any of the information which you received. Please check any of these which you experienced." (seven alternatives given) (Sieber)

-- "What were its bad or awkward features?" (Timbie & Coombs)

In those studies which included users, only one employed surrogates. Hull and Benson asked librarians to estimate user' purposes in making ERIC searches. Many of the studies included non-users as well as users and focused on people, not ERIC. Two studies (Magisos; Sieber) went even further in this regard by focusing on information needs, not ERIC nor people -- this is similar to Dervin's procedure (Section II-D).

The reliability of the measures was addressed in only a few of the studies. Questionnaire items did not seem to be ambiguous, though several studies asked about "usefulness" which, without proper follow-up, may not be interpreted correctly. Validity was not explicitly considered in any of the studies though the questionnaire items appeared to be directly and obviously related to what was being measured. Responses to questions asking for simple answers (e.g., how useful, was it useful, did you use it, etc.) should have been "validated" by asking respondents to describe how they used it. Only a few studies did this consistently.

Because most of the studies used questionnaires or interviews, there was frequent use of multiple (verbal) measures. Behavioral measures were not used very much. Fry's study employed site visits and panel (Delphi) groups in addition to survey methods. In a non-impact part of Sieber's study, field observers observed the field agents as they moved between the information center and the practitioner; the impact portion of the study relied primarily on questionnaires. In addition to these studies, the most common unobtrusive measurement procedure was to study sales or circulation figures (Fry; Burchinal) or transcripts of users' interactions (Summit).

Only two studies made any attempt to assess indirect impact. Denby asked

respondents to estimate the effect that their use of ERIC has on their students. Sieber used the following four questions:

-- "Did you talk about any of the contents with anyone?"

-- "If so, with whom?"

-- "Did you give or loan any of the information to anyone?"

-- "Do you think that the information or materials was helpful to the other client?"

Another question, asking "how it helped", would have been useful -- though ideally, it would have been better to ask these questions of the indirect users (students, colleagues) rather than relying on the opinions of the direct users.

B. Specific Impact Measures.

Listed below are most of the impact measures or questions used in these studies along with any noteworthy methodological practices. Items in quotation are taken verbatim from the questionnaire or interview guide included in the research report. Closed-ended questions are followed by a description of the categories used. In some instances, questions can be raised about the appropriateness or validity of the items as impact measures. Rather liberal standards were applied in selecting items to give an indication of the range of measures used.

1. Savings. In general, saving impacts focused on time savings (using ERIC rather than other information sources or services) rather than dollar savings. The approach taken was to ask users for their estimates of savings; more objective procedures were not used -- probably because most of these "impact studies" used survey methods. Even with this limitation it would have been possible to seek some evidence (e.g., a description of an actual incidence of

time savings) which supported the user's reply.

-- Savings were implied by the goals of ERIC and inferred by sales or subscription figures. (Burchinal)

-- "If your institution does not possess ERIC resources, how (or where) have you obtained them?" One of the closed-ended alternatives was, "at personal expense". (Denby)

-- "Has information obtained through the ERIC system prevented you from duplicating research work that has already been done by others? (If yes, how often?)"* (Fry)

-- "How effective are (ERIC) journal columns in reducing your dependence on other means to obtain current references to ERIC publications?" (A. highly effective; B. moderately effective; C. not very effective) (Fry)

-- "Has information obtained through the ERIC system resulted in improvements in the way you do things? (If yes, how often?)" (Fry)

-- "How effective is the . . . newsletter in reducing your dependence on other means to obtain current references to educational research and research related materials?" (5-point scale ranging from 'very effective' to 'never effective') (Stanton)

2. Novelty. Though novelty and its related measures, ease of use and turnaround time, were not measured more often than savings or uses, they were measured with a wide variety of question types. Again, use of critical incidents would have helped to validate users' responses, as would other "follow-up" questions aimed at determining the extent and consequence of the novelty.

-- "Have you ever found information through the ERIC system which you probably would not have found otherwise? (If yes, how often?)" (Fry)

-- How often do the ERIC columns in journals bring to your atten-

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*A questionable savings. See the discussion earlier, Section II-A.

tion important materials that you probably would not see elsewhere?" (A. often; B. occasionally; C. never) (Fry)

-- If you need information to solve an important problem in your work, what is the farthest that you would be willing to go to examine it?" (6 alternatives ranging from "same office or room" to "another town or city in another state") (Magisos)

-- Turn-around time was estimated in calendar weeks. (Sieber)

-- "How often does the newsletter bring to your attention important materials that you probably would not see listed in any other place?" (Scale ranging from "very often" to "never") (Stanton)

-- One study reported that users of ERIC online were impressed by "horizontal widening" (a type of novelty) and speed of interaction. It is not clear how the investigators made this determination. (Summit)

-- "What new questions did you formulate during your search?" (Timbie & Coombs)

-- "Did you run across any other material -- perhaps entirely different subject -- which interest you and which you might want to search later?" (Timbie & Coombs)

3. Uses. Fourteen of the "impact studies" included uses measures; the only two exceptions were not surveys, but case-like descriptions of the same ERIC outlet (Summit; Timbie & Coombs). Included among the uses measures were undifferentiated estimates of "usefulness" -- clearly a more ambiguous impact standard because one cannot tell how or why the respondent judged its usefulness. Follow-up questions along these lines were included in several of the studies.

Many of the uses questions were closed-ended with numerous alternatives. By and large, use assessment has been limited to professional impacts.

Sieber's study deserves special mention not only because it had the greatest number of alternatives, but also because several types of questions about

uses were asked, including subjective appraisals, personal impacts, open-ended rating scales, and open-ended critical incidents.

-- "How about the practical value of the information or assistance?" (Both information and assistance were rated on a 4-point scale ranging from "very useful" to "not useful".)*

-- "Please describe in as much detail as possible the actual use you made of the information or assistance." Responses were categorized as follows:

"1. a specific practice or program was implemented

2. vague response indicating that some implementation occurred

3. used for planning or proposal writing

4. material was read, but no specific use was made of it

5. negative comment about material"

-- "Perhaps there were additional ways in which the information or assistance helped you. Please look over the following lists and indicate whether or not you benefited in each of the ways specified.

- I learned something new
- it gave me new resources for helping other staff members
- it helped with curriculum development
- it improved my skills
- it made my job easier
- it helped with an administrative problem
- it helped in preparing a speech, report, or article
- it helped me have greater self-confidence
- it helped in developing instructional packages
- pupils learned new information or skills

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*For future impact studies, it is worth noting that the respondents rated the assistance to be more useful than the information. ERIC was only one component of the information system investigated in this study.

- other school or agency personnel appreciated me more
- pupils learned faster
- it helped with pupils' growth
- pupils' discipline was improved"

Other uses measures included the following:

-- Anecdotal use estimates from library staff. (Burchinal)

-- For each of 25 ERIC products or resources, respondents are asked if they used it and if so, what are the "most fruitful uses". (25 questions, each with 6 specific alternative uses.) (Denby)

-- "Do you anticipate using ERIC resources in additional ways than you have mentioned above? (If so, what?)" (Denby)

-- "Please rate each of the following ERIC products and services in terms of its usefulness in your work or study." (17 products or services each rated on a 5-point scale ranging from "very useful" to "of no use".) (Fry)

-- "How would you rate the ERIC system as a whole as to its usefulness in your work or study?" (4-point scale ranging from "of considerable value" to "of no value".) (Fry)

-- "If you observe or assist patrons in the use of ERIC products or services, please rate each in terms of its observed usefulness and on the basis of your actual experience in providing service." (17 products or services each rated on a 5-point scale ranging from "very useful" to "of no use".) (Fry)

-- "On the previous page you told us how frequently you used a number of information sources in connection with two important work activities. Now please consider all the activities you perform and rate this same list of sources in terms of their usefulness in providing you with the information you need for any part of your work." (18 specific information sources including workshops, journals, and personal libraries. Each rates on a 3-point scale ranging from "highly useful" to "of minor use".) (Hood)

-- "How are the ERIC materials most frequently used? Indicate a per-

centage -- estimate if necessary." (Followed by a list of specific alternative uses.) (Horne)

-- "In your judgment, what have been the purposes of the ERIC microfiche searches? (Rank in order, 1 = most important.)" (Followed by seven specific alternatives.) (Hull)

-- "Listed below are some uses or applications that educators have for information. Although the subject of the information may determine its use, please check all uses that you generally have for information in your primary education role." (Followed by 10 specific alternatives.) (Hull & Wanger)

-- "How do you rate the ERIC system as a whole as to its usefulness in your work?" (Scale ranging from "of considerable value" to "of no value".) (Shanklin)

-- ". . . rate the following sources of information according to the value you place on their effectiveness in keeping you up to date on educational research . . ." (Scale ranging from "very effective" to "never effective".) (Stanton)

-- "In the following question please indicate how useful the document was to you for each of the purposes listed." (7 specific alternatives each rated on a 3-point scale ranging from "very useful" to "not at all useful".) (Wanger)

-- "As a result of reading the document did you use the information or the document in any of the following ways?" (Six alternatives.) (Wanger)

-- "If this document had any special effect on your work, please describe the kind of effect it had." (open-ended) (Wanger)

-- "In general, how would you compare this document with other documents of the same type?" (3-point scale ranging from "it is a very useful document" to "its usefulness is too limited to justify its publication".) (Wanger)

-- "Bibliographies can serve a variety of purposes and fulfill many different information needs for users. In the following question, please indicate how you used the document." (6 alternatives) (Wanger)

-- "As a result of using this document, did you examine any of the documents cited? (If yes, was the content of the document what you had been led to expect by the content of the bibliographic reference?)" (Wanger)

-- "Would you recommend this document to your colleagues in the educational community? (If yes, for each purpose given below, indicate how useful you believe it might be.)" (7 alternatives, each rated on a 3-point scale ranging from "very useful" to "not at all useful".) (Wanger)

IV. Research Designs for ERIC Impact Studies

A. General Considerations.

The diversity and characteristics of the various ERIC products and services precludes any single research design to assess their impact.

ERIC has total control over the type of products and services offered, their format, style, arrangement, and frequency. Any planned change in one or more of these characteristics has the potential to be studied experimentally -- such as by introducing a new product slowly and at random, or by maintaining both the old and new versions with random distribution of each. For example, a new thesaurus can be distributed to the SOCs in two waves; the first wave to a random half of the SOCs and the second wave to the remaining SOCs, but only after collecting impact data from end-users or both groups of SOCs.

In a similar vein, experimental or acceptable non-experimental impact studies can be implemented whenever new organizations are added to the ERIC system as SOCs. Randomly pair the organizations and delay providing materials to one set of the pairs until after the impact study is completed.

Assessing the impact of computer tapes is more difficult because ERIC does not provide a computer searching service. Some experimental studies of the computer tapes may require the cooperation of the service providers. Or, it may be possible to produce two versions of the computer tapes and distribute

each version to a different group of service providers. By carefully choosing which SOCs to study, an experimental or an acceptable non-experimental design is possible.

And lastly, users and potential users of carefully selected SOCs and CHs should be queried on a regular basis. This will begin to implement a regular study of performance and impact, it will obtain micromeasures, and it provides the needed before measures if any one of the three acceptable non-experimental designs are to be carried out at a later time.

B. A Detailed Example.

Information Analysis Products (IAPs) are an important and expensive component of ERIC. Well over 1000 were produced by 1975. Several years ago they occupied a larger portion of each CH's budget (Wanger reports 40-45%) than they do now (about 10-20%), but that is still a considerable amount of money. Presumably the intended impact of the IAPs is to make the materials more accessible to, and more understandable by, end-users.

This section will briefly review Wanger's study -- the only study which focuses on IAPs and will outline two research designs which could have been conducted when the IAPs were initiated, and to some extent, can still be conducted to assess their impact.

1. Wagner's study (ED 064 527-8). Wanger stud he reactions of a wide variety of educators to a sample of 135 ERIC CH products prepared in 1969-70. Her first questionnaire (Q1) was sent to over 4000 educators, some of whom were selected randomly and the rest chosen more purposefully from ERIC mail lists and similar sources. The response from Q1 (return rate = 64%) was analyzed to separate the educators into two categories: users of ERIC and non-users. The users (N=1837) were sent a second questionnaire (Q2) and asked

to react to 10 surrogates of ERIC products. Replies from Q2 (return rate = 68%) were divided into a reader and non-reader category. The non-users (N=361) were sent a third questionnaire (Q3). A fourth questionnaire (Q4) was sent to a separate sample of education specialists who were asked to read some of the ERIC documents and react to them.

ERIC products were analyzed in terms of:

-- quality: coverage, up-to-dateness, format, clarity of writing

-- utility: use, degree of usefulness, relevance, need

-- impact: (asked only of readers), how was it used in their everyday decisions

The major findings indicate that ERIC products are known and positively valued, used and useful to a limited public. In the analysis of impact, Wanger found that ERIC products assist educators in their everyday planning, classroom applications, research design, and other professional decision-making situations. Readers of ERIC products serve as information sources to other educators multiplying the impact. And readers of ERIC bibliographies report that they use them to find other helpful items of information. Wanger concludes that the products are favorably received but underutilized. She recommended that "two separate evaluation studies be conducted in the future:

-- An assessment of the outreach of products, using both random and non-random samples, should be made periodically, particularly after the implementation of an improved announcement system or of modifications to the delivery system.

-- A continuing evaluation program should be instituted to provide the original units with current feedback on NCEC products."

It is very interesting to note that these recommendations fall within the spirit

of EVOP. But the ey component of true experimentation is not mentioned. This is an important consideration, because no matter how competently executed the study (Havelock notes some weaknesses in the questionnaire methodology), it is still subject to difficulties arising from self-selection of respondents to analysis categories. That is, users (both readers and non-readers) and non-users of ERIC products may differ on various personal and professional related variables -- which will hamper any unambiguous assessment of the impact of these products. Or to give another example, ERIC users may be regular, eager searchers for new information. In such a situation, it would not be justified to conclude that one impact of an ERIC produced bibliography is the number and use of new information items; the reader might have found these items, or even better items, if the IAP were not available. Only a true field experiment can cope with these potential problems.

2. A true field experiment. In order to remove the potential problem of self-selection inherent in survey research, it will be important to make a comparative analysis among groups of educators who are (or who are not) ERIC users. In this proposed study only ERIC users will be included.

The users need to be identified and randomly split into two relatively homogeneous groups: those who received one or more IAPs and those who have not. Given that the users in both groups requested the IAPs and given a large enough sample of educators in each group, then any difference between the groups in terms of various impact measures can be attributed to the IAPs.

The study can be conducted at a single CH or at many CHs. And depending upon the scope of the study, it may require the cooperation of EDRS in order to include those users who request IAPs from that source. For simplicity the study to be described here is in terms of a single CH.

1. When requests for IAPs are received, a coin-flip is used to decide whether or not the request will be honored. Those denied the IAP can be told it is "out of print" or they can be told, at least in some general sense, something about the study. Of course, if those denied are told about the study, those who were not denied should also be told.

   A complete record of each IAP request is needed, including date of request, requestor, IAP requested, and whether the request was honored. If the demand for certain IAPs is particularly heavy, it would be useful to stratify the groups in terms of IAPs; try to keep an equal number of denied and not-denied requests for each of the high demand IAPs.

2. At some time later contact all requestors to determine the impact of the IAPs. For bibliographies one could ask if the citations found were previously unknown. Were they read? Were they thought to be useful? Were they actually used? And if so, how were they used? Notice that the same question will be asked of those denied and those not-denied. For review articles the measurement problems are a bit more difficult but one possibility is to interview requestors of the same IAP and ask what they have thought about and completed since the request. Were those denied more likely to drop a line of inquiry? Were those denied less productive in terms of the subject matter in the IAP? Did it take a longer time for those denied to discover the information in the IAP?

   The interviews can be conducted by mail, phone, or in person, depending upon the depth and complexity of the specific

question asked and the budget of the study. It is important, however, to ascertain the fact that those denied an IAP by the CH did not obtain a copy elsewhere.

The timing of this interview is important and with a large enough sample size it would be best to conduct the interview over different subsets of requestors at different time periods -- say two weeks after replying to the request, plus one, two, four, and six months after. This would permit an assessment of "catch-up" time, which as mentioned earlier, is in some sense an impact measure.

3. When the study is completed, it may be useful to maintain a more limited program of random denials for IAPs across all the CHs. If properly conducted, it can provide a trustworthy mechanism to assess any changes in ERIC policy or procedures regarding the IAPs.

3. Non-experimental approaches. Though it appears that randomization of end-users is possible within a given CH, it may be too difficult to carry out in actual practice. Other research designs (II, III, IV) are possible. However, there are some peculiar problems studying IAPs which makes these designs less attractive alternatives and more difficult to implement: IAPs are products of CHs and CHs are subject-specific. Therefore, if CHs are treated as units, the subject matter confounds the results. That is, will the obtained differences between the units be due to the availability of the IAPs or due to the subject matter? Unfortunately, there is not any simple solution to the problem -- a true field experiment is clearly the best choice. But assuming that is impossible, the next best alternatives are to:

-- work with only one CH (as in design II) and limit the conclusions to the end-users of that CH and to that subject matter

-- use many CHs and employ randomization to divide them into two groups in an attempt to "equalize" the groups in terms of subject matter

V. Summary

Impact is the ultimate goal of any information system -- to have an effect on the lives of its users. However, studies of information systems rarely deal with impact, primarily because it is difficult to measure. Instead, other goals or sub-goals (such as effectiveness or efficiency) are analyzed. The purpose of this paper was to discuss and recommend methods and measures which could be used in future studies of the impact of ERIC. Certainly few of these recommendations are new. But because they have not found their way into research practice they bear repeating.

The major methodological recommendation is to use true field experiments. None of the existing ERIC "impact studies" was experimental -- causing their findings to be less clearly interpretable. Gilbert and his colleagues reviewed research studies in other human service areas and concluded that:

> "one characteristic of nonrandomized studies that shows up in context after context is that even after repeated studies had consistently gotten the same results, there was always room to doubt the validity of the finding." (p. 134)

And, note that these authors found interpretation difficult even when several studies agreed. Studies of ERIC impact are too few and too different to form a reliable basis for estimating the amount of agreement among their results.

No single measurement recommendation was made. Instead, future researchers are encouraged to make use of those procedures and standards which are relatively well known. From the literature of information systems comes the suggestions to include non-users as well as users (no surrogates). Focus the initial questions on people or their information needs rather than on the particular system being studied. And lastly, include the users' interactions with all components of the system and with his friends and colleagues afterwards (indirect usage). From the literature of social science measurement comes the suggestions to use several measures instead of one, including the use of unobtrusive measures. Improve the reliability and validity of all measures by pretesting, removing ambiguity, using critical incidents to aid recall, training interviewers, etc.

Taken together, these suggestions will improve the state of practice of impact assessment.

After surveying studies of ERIC, only 16 could be found which contained some impact component. Some of these studies were impressive in scope and in execution (e.g., Asher & Vockell; Fry; Hood; Sieber; Wanger). None of the 16 studies made a major or unique breakthrough in the measurement of impact. This is not a criticism but rather a reflection of what seems to be an accurate picture of the current state of impact measurement. New and powerful methods for measuring impact may not be easy to come by, and the surest road toward better impact studies is the systematic application of procedures which have been tried in related research areas.

Appendix A

ERIC "Impact Studies"

1. Asher, William, and Vockell, Edward. Information quality and educational decision making. 1973. ED-086-214.

*2. Burchinal, Lee G. Evaluation of ERIC, June 1968. 1968. ED-020-449.

*3. Denby, Robert V. A study of educational resources information center use by educators of English language arts teachers and the development of pertinent instructional modules. University of Illinois. Doctoral Dissertation. 1974.

4. Fry, Bernard M. Evaluation study of ERIC products and services. 1972. ED-060-923 through ED-060-926.

5. Hood, Paul D., et al. The educational information market study. 1976. ED-135-411.

6. Horne, Eleanor V. A profile of ERIC microfiche collection sites. 1976. ED-126-161.

7. Hull, William L., and Benson, Gregory Jr. Installing a coordinated information network in a state education agency. 1972. ED-061-428.

8. Hull, Cynthia C., and Wanger, Judith. Educational resources information center (ERIC) file participation study. 1972. ED-067-520.

9. Magisos, Joel H. Interpretation of target audience needs in the design of information dissemination systems for vocational-technical education. 1971. ED-061-417.

10. Rittenhouse, Carl H. Innovation problems and information needs of educational practitioners. 1970. ED-040-976.

*11. Shanklin, William L. A marketing study of an underutilized social resource: the educational resources information center. University of Maryland. Doctoral Dissertation. 1972.

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13. Stanton, Vida Cummins. ERIC newsletters: the content, uses, and users. 1972. ED-107-234.

14. Summit, Roger K. ERIC online retrieval system. 1970. ED-040-592.

15. Timbie, Michele, and Coombs, Don. An interactive retrieval system. 1969. ED-034-431.

16. Wanger, Judith. Evaluation study of NCEC information analysis products. 1972. ED-064-527 through ED-064-528.

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